# Job quality in relation to health and attendance behavior

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# Abbreviations

## A

| | |
|---|---|
| ANCOVA | Analysis of covariance |
| ANOVA | Analysis of variance |

## B

| | |
|---|---|
| BMI | Body Mass Index |

## C

| | |
|---|---|
| CE | Collision energy |
| CFA | Confirmatory factor analysis |
| CFI | Comparative Fit Index |
| CI | Confidence Interval |
| CV | Coefficient of Variation |

## D

| | |
|---|---|
| DP | Declustering potential |

## E

| | |
|---|---|
| EFA | Exploratory factor analysis |
| ELISA | Enzyme-Linked Immuno Sorbent Assay |
| ERI-model | Effort-Reward Imbalance -model |
| EU | The European Union |
| EWCS | The European Working Conditions Survey |

## F

| | |
|---|---|
| FWI | Family to work interference |

## H

| | |
|---|---|
| HCC | Hair cortisol concentration |
| HPA | Hypothalamic-pituitary-adrenal -axis |
| HWC | Home-to-work conflict |
| HWI | Home work interference |

## I

| | |
|---|---|
| ILO | International Labor Organization |
| ISCO | International Standard Classification of Occupations |

## J

| | |
|---|---|
| JCQ | Job Content Questionnaire |
| JDC-model | Job Demand Control-model |
| JDCS-model | Job Demand Control Support-model |

## L

| | |
|---|---|
| LC-MS/MS | Liquid chromatography tandem mass spectrometry |
| LOQ | Limit of quantification |
| LSA-MH | Long-term sickness absence due to mental health problems |
| LSA-MD | Long-term sickness absence due to musculoskeletal disorders |
| LTSA | Long-term sickness absence |

## M

| | |
|---|---|
| MRM | Multiple reaction monitoring |

## O

| | |
|---|---|
| OR | Odds Ratio |

## R

| | |
|---|---|
| RMSEA | Root Mean Square Error of Approximation |
| RRR | Relative Risk Ratio |

## S

| | |
|---|---|
| SD | Standard deviation |
| SE | Standard Error |

## T

| | |
|---|---|
| TLI | Tucker–Lewis Index |

## U

| | |
|---|---|
| US | United States |

## V

| | |
|---|---|
| VPC | Variance of Partition Coefficient |

## W

| | |
|---|---|
| WHC | Strain based work-to-home conflict |
| WHI | Work home interference |

| | |
|---|---|
| WHR | Waist-hip ratio |
| WFC | Work-family conflict |
| WFI | Work to family interference |
| WLSMV | The Weighted Least Squares Means and Variance |

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# Chapter 1.

# Introduction and research aims

In the last decade, the quality of jobs has gained growing attention in Europe. Researchers became convinced that improving working conditions and employment quality will have beneficial effects on the health and wellbeing of employees. Recently, also an increasing number of employers are attempting to enhance several aspects of job quality, in order to increase productivity and to prevent expenses due to sickness absence. Furthermore, legislators became more and more aware of the importance of this topic, which is reflected in the Lisbon Strategy and the Europe 2020 targets of the European Union (EU) [1]. In addition to improving the employment rates in Europe, this strategy puts emphasis on the qualitative aspect of jobs, which has to become one of the major concerns. The key objective of Europe can be expressed as: "Creating more and better jobs". In this perspective, it is relatively easy to monitor the number of jobs in Europe, whereas it is a more challenging task to identify the features of a 'good job'. Several models, containing a variety of work factors and indicators, distinguishing 'good jobs' from 'bad jobs', have been proposed by researchers from different schools. Mainly based on the model of Munoz-Bustillo et al. [2], **job quality** can be considered to include work quality and employment quality (figure 1.1).
For an overview of the main concepts and definitions used in this thesis, we refer to the table 1.1 at the end of the introduction.

**Employment quality** refers to the wage, working hours and other specific aspects of the mutual agreement with associated social protection systems and security. While Europe stresses the importance of this element of job quality, the globalization and growing flexibilisation of the labor market is associated with an increasing number of jobs with insecure features or aberrant working time arrangements and less social protection [3]. According to the European Commission, about one quarter of all jobs in the EU can be considered as precarious or low quality jobs [3]. Also in Belgium, an increase of temporary contracts and other precarious arrangements with more job insecurity is observed, which is mainly due to the economic crisis. Furthermore, some recent lawmaking initiatives diminishing the distinctions between blue collars and white collars may also have led to a rise of this type of insecure contracts. In Belgium, results from the fifth European Survey on Working Conditions demonstrate that about 13.9% of the workers are employed in a temporary contract [4].


**Figure 1.1.**: Based on model of Munoz-Bustillo [2]

**Work quality**, representing the other aspect of job quality, can be divided into working conditions and work content. Working conditions mainly refer to the physical, chemical and biological circumstances of the job, and to the concomitant countermeasures and protective devices. Work content generally refers to the kind and the amount of work that has to be done, and which methods workers are using to perform these tasks. It is related to work organization and the psychosocial work environment. Besides work content, also the social relations at work (with colleagues and supervisors) are playing an important role in the employee's perception of the psychosocial working environment. Holman & McClelland introduced characteristics of skills and development, social relations, communication and representation as a separate area, which was called "**Empowerment Quality**". The latter dimension also included issues as learning opportunities and developmental possibilities. [5] (figure 1.2).

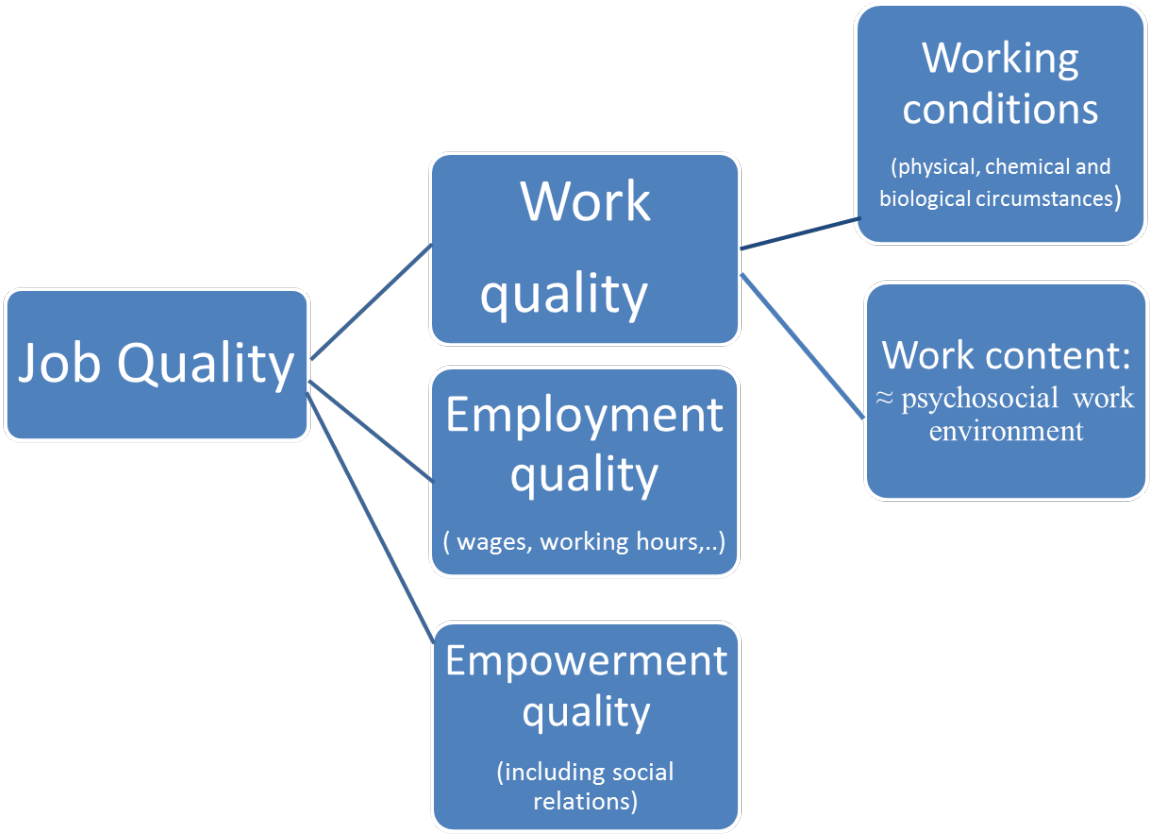


**Figure 1.2.**: Based on model of Holman & McClelland [5]

Additionally, the increase of work intensity and job demands may create a situation in which workers perceive problems to adequately combine work and family life. This **work-family conflict** occurs when there are incompatible demands between work and family roles [6] and can be considered a stressor which takes place at the work-life interface.

In Europe, a reduction of the number of serious injuries at work is observed, while the numbers of work-related health problems are increasing, which is mainly attributed to the increase of musculoskeletal problems and workplace-related stress [7]. Also in Belgium, several reports were published describing the growing numbers of workers with stress complaints and burnout. A recent

white paper of Securex published in 2015 reports that two thirds of the Belgian workers perceive stress at work, which means an increase of 18.5% over a period of 5 years [8]. Additionally, one quarter of the workers perceive more than one stress-related health complaint (which may be both psychological and physical) and these complaints are interfering with job productivity [8]. The Belgian legislation concerning psychosocial risks at work was recently adapted. This implies that measures need to be proposed and implemented, not only to prevent violence, bullying and unwanted sexual behavior, but the whole range of work psychosocial risk factors that could affect the health of the worker have to be covered [9].

The relation between several aspects of job quality and a variety of outcomes has been studied by researchers from several schools. Health (both psychological and physical) and health behavior variables, were used as outcome, but also some more attitude related variables (such as job satisfaction, leave intention and absenteeism) have been subject of investigation. Especially sickness absence is gaining growing attention since 1990s in most European countries, because related costs are substantial for both society and employers. In their most recent publication, Securex estimated the total cost which includes both direct (secured wages) and indirect costs (reorganizational problems, replacement costs, quality loss, reduced productivity) related to sickness absence in 2014 at € 1.024.258 for an employer with 200 workers [10]. A second important conclusion from this publication was that the frequency of sickness absences is decreasing since 2008, but the average duration of a sickness absence spell is increasing. The authors explain this decreasing sickness absence frequency by the unusual minor flu epidemic and by the increasing trend of presenteeism [10]. Although presenteeism is suggested to be associated with more costs than sickness absence, most employers are not paying attention to this potential noxious behavior of their workers. Similarly, in research, both concepts are separately developed by different research groups with other interests. However, both behaviors (presenteeism and absenteeism) are alternative endpoints of the same decision making process an ill worker is going through: “Shall I go at work or shall I stay at home?”

## 1.1. Attendance dynamic in case of illness: sickness absence or presenteeism

So far, research on the attendance behavior of the employee particularly focused on causes and consequences of sickness absence, while presenteeism as a part of the attendance behavior is only recently gaining some attention.

### 1.1.1. Sickness absence

Absenteeism, which is generally defined as not showing up for work when scheduled, is one of the most examined constructs not only in organizational behavior and human resources, but also in occupational health research [11]. Absenteeism can have diverse reasons, such as illness or family duties (for instance the care for a child or elder person). In this thesis, only absenteeism due to illness is focused on. Sickness absence arises when someone is not able to attend work due to illness or weakened state of well-being [12, 13].

Although sickness absence is considered as a good measure for physical and psychological functioning and health of the working population [14-17], work-related factors, personality and economic context variables are also important determinants of sickness absence. Therefore, sickness absence is a

possible result of a complex decision making process [18], which is determined by several factors, both illness and disease and person-related factors, but also work environment.

Although sickness absence is certainly necessary since it allows the worker to recover from illness, it should be noticed that there are also several negative consequences. The majority of studies investigating the consequences of absenteeism focus on the economic impact for the employer and society [10]. Additionally, a few studies demonstrated that workers can be confronted with some negative consequences of this behavior, such as decreased career opportunities, less income, but also an increased risk for suicide [19].

*Measurement*

With respect to the measurement of sickness absence, researchers can occasionally rely on organizational records provided by personnel administrations of the employer or other agencies. These objective measurements are generally preferred, since they are considered to be objective and quite reliable. Nevertheless, these data are not always accessible for researchers or may not be present for some groups of workers or may be biased. Therefore, self-reports are often used in health and organizational behavior research. Although some controversy exists around the use of these self-reports, it is generally concluded that self-reported absenteeism may be a valid measure in correlational research designs [20].

Several ways of operationalization of sickness absence data have been described. Most commonly used are time lost absence (total number of days absent) and indices of absence frequency (number of times absent) [21]. In this perspective, time lost absence measures are rather considered as involuntary [22], because longer absences are expected to result from factors (such as illness and disease) beyond a person's control, whereas absence frequency measures are interpreted as voluntary because such absences are shorter in duration and should rather reflect factors within an employee's control [22]. However, there is still much debate about this difference between voluntary and involuntary absence and their underlying processes [21].

### 1.1.2. Presenteeism

Although less extensively studied until now, presenteeism, as an alternative aspect of the attendance dynamic of the ill employee, has become a subject of interest. A variety of definitions has been applied in several domains of research [23], of which especially the definition of Aronsson, Gustafsson and Dallner [24], defining presenteeism as attending work despite illness, is interesting from an occupation health perspective.

An important number of studies, mainly from the North-American scholars, solely focus on work productivity loss as a consequence of presenteeism, and tried to estimate the costs associated with this behavior [25]. Consequently, presenteeism can be estimated as a percentage of reduced productivity, somewhere in between the ideal situation of full productivity and no productivity, in case of absenteeism. The act of presenteeism is recently receiving growing interest mainly from managers and economists, since several studies suggest that the costs associated with presenteeism are succeeding those associated with sickness absence [13, 26-28]. Therefore, management of presenteeism is considered being a promising source of competitive advantage [29].

In contrast to the North-American researchers, European epidemiologists and occupational health researchers are more focused on determinants and individual health consequences of presenteeism.
Generally, determinants of presenteeism can be divided into i) personal related correlates, ii) job-related correlates, and iii) macro-economic determinants.

From an employer's perspective, presenteeism is equaled to reduced productivity, which involves considerable expenses. But also for the employee, presenteeism may have negative implications. Kivimäki et al. demonstrated that the incidence of coronary heart disease was twice as high in the group of unhealthy workers that never took sickness absence in comparison with the unhealthy employees with moderate levels of sickness absence [30]. Prospective studies demonstrated presenteeism as an independent risk factor for future poor general health and physical complaints [31, 32], but also for mental health problems, exhaustion and burnout [33-37].
A limited number of studies additionally observed a prospective relation between presenteeism and sickness absence, indicating that attending work while ill may be a risk factor for future absenteeism [36, 38, 39].
Several hypotheses have been proposed to explain the mechanism between presenteeism and prospective cardiovascular events. First, working while ill may induce an acute stress reaction, which may act as a trigger on a preexisting cardiovascular disease and therefore lead to a cardiovascular event [30]. However, this 'triggering hypothesis' has been argued by a study of Westerlund et al.[40]. The most influential hypothesis in this research area is the 'allostatic load hypothesis', which is essentially stating that working while ill, may contribute to an enhanced psychological burden with consequences for the development of disease. In this viewpoint, the lack of rest and recuperation with accumulated tiredness may lengthen the duration of certain diseases and increase the risk of deleterious consequences [41]. Finally, it was also hypothesized that presenteeism rather is an indicator of a lifestyle, in which medical care and symptoms are neglected [42].

*Measurement*
In contrast to absenteeism, which can be easily measured when relying on administrative records, objective measurement of presenteeism is a challenging task. In line with the main schools of presenteeism, two separate streams of measurement can be distinguished. First, several authors developed productivity loss instruments, which generally ask respondents to estimate how their health status has influenced their productivity. On the other hand, measurement instruments to quantify the 'act of presenteeism' itself have been developed. These are generally based on self-reported measures, asking the respondents to indicate when they attended work despite illness. One of the most often used instruments in research is the one item question, which is assessing the frequency of going to work despite illness during the last 12 months [24, 33, 43-45]. Generally, answer options are categorized in 'never', 'once', '2-5 times' and 'more than 5 times'. Although applied in a large body of studies, this question has been criticized: the discontinuous frequency scale has been judged too crude and also the time frame of 12 months is subject of debate [23]. A reliability of $\geq 0.58$ has been reported for this question for 6 months and 1 year intervals [33].

### 1.1.3. Attendance dynamic

Although sickness absence and presenteeism are both alternative endpoints of a common decision making process, going to work or not, both concepts have mainly been developed separately from

different research fields. Johns argues that any theory of presenteeism would need to account for the relationship between absenteeism and presenteeism [23]. In this view, **the substitution proposition**, tested by Caverley et al [46], is noteworthy: employees are thought to substitute sickness absence for presence. They might spend more time at work while ill instead of staying at home, which may be due to job insecurity and workplace demands. Consequently, presenteeism is considered as an alternative for sickness absence [24, 47]. Notwithstanding, several studies showed a positive cross-sectional correlation between presenteeism and sickness absence [24, 43, 44, 48], which is suggesting that both behaviors are linked together by the impact of common determinants and is often referred to as **the complementary hypothesis** [23]. This inconsistency between the substitution proposition, which supposed an inverse correlation between both concepts, and the positive correlation found in several studies, was further investigated by a few authors [49, 50]. This study concludes that besides health status, personality and work environment, other yet unidentified factors play a role in the complex decision making process of the attendance behavior [49].

Johns also proposed **a dynamic model of presenteeism and absenteei**sm [23], in which the fully productive attendance can be disturbed by several types of health conditions: acute (e.g. the flu), episodic (e.g. migraine) or chronic (e.g. diabetes) health problems. The severity of the disease will determine if a worker chooses for absenteeism or presenteeism. Generally, acute health problems will provoke sickness absence, while for the less severe health problems, work context and personal factors will become more important (see figure 1.3). The model also contains some individual consequences of the attendance behavior. Additionally, it is interesting to notice that Hansen et al. [44] found that work-related factors were slightly more important than personal circumstances.

In conclusion, no clear overarching theory has been proposed to explain the mechanism through which antecedents are influencing different aspects of attendance behavior and their specific relationship. Consequently, the term ‘attendance behavior’ is applied as an umbrella term implying both sickness absence and presenteeism without specifying the underlying processes leading to this behavior.

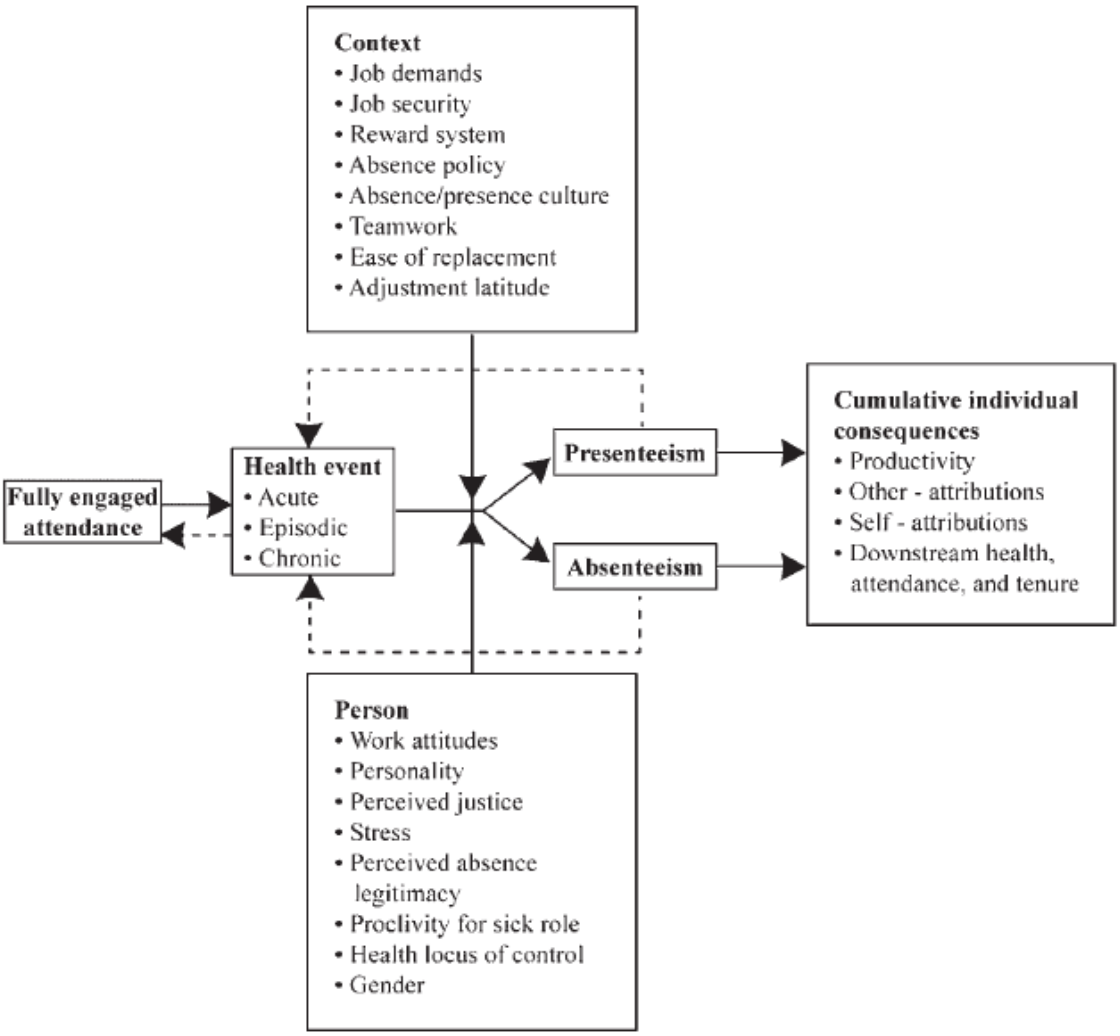


**Figure 1.3.**: Dynamic model of absenteeism and presenteeism [23]

## 1.2. Antecedents of attendance behavior

Following the dynamic model of Johns [23], not only the health status of the worker but also work-related factors and personal related factors play a role in the complex decision making process of the attendance behavior.

### 1.2.1 Personal related features as antecedents of attendance behavior

**a) Socio-demographic variables**

Socio-demographic variables, such as age and gender are important confounders in relation to sickness absence. It was repeatedly observed that women are demonstrating higher sickness absence and also age has been identified as a strong predictor, with higher age groups having higher absence [51]. Besides age and gender, also socio-economic status has been established as an important confounder: there is a clear negative association between socio-economic status and sickness absence [51].

Conversely, the relation between these socio-demographic variables with presenteeism is less clear. With respect to gender, inconsistent results were found [24, 43, 52]. Although the majority of studies include age as a control variable [44], there is still minor evidence for a clear relation between age and presenteeism [53]. With respect to socio-economic status, it is suggested that presenteeism is higher when the hierarchical level rises [53].

**b) Health behaviors and lifestyle**

The particular effects of smoking, overweight, physical exercise and physical fitness have been addressed in relation with sickness absence. Briefly, smoking, overweight and poor physical condition were associated with a higher risk for sickness absence [51].

Again, the impact of these health behaviors on presenteeism has not yet extensively been examined, as it was the case for sickness absence. Nevertheless, a few studies reported that smokers have more presenteeism [54, 55]. The results for overweight and obesity are not always conclusive. Generally, the majority of studies showed that obese employees had higher rates of presenteeism, while the results for overweight were less convincing [56-62]. Hence, this effect of weight appeared to have a threshold effect in some of the studies: moderate or extreme obese workers showed the largest health-related work limitations, while their overweight colleagues reported no or less productivity problems while on the job. Finally, several studies suggested an inverse association between physical activity (objectively measured and self-reported) and presenteeism [63-65].

As mentioned by Allebeck and Mastekaasa [51], it can be subject of debate whether overweight is a lifestyle risk factor or rather should be addressed as a health indicator. Since literature often presents overweight as a lifestyle related risk factor, this is also done in this thesis [51].

**c) Health, illness and disease**

The model proposed by Johns [23], displayed in figure 1.3, demonstrates that fully productive attendance may be interrupted by a 'health event', which can be either acute, episodic or chronic. The nature of the health event will direct the worker to presenteeism or absenteeism. An acute event will rather provoke absenteeism, while a chronic condition will likely induce presence. In less extreme situations, context factors and personality will play a role.

The amount of studies specifically measuring the relative part of specific health problems in sickness absence are scarce, and are mainly derived from United States (US) insurance company databases aiming to calculate related expenditures due to specific diseases. In several studies, the largest expenditures for absenteeism and short-term disability are attributed to cardiovascular disease, musculoskeletal disorders, ear, nose and throat conditions, hypertension, diabetes, and depression-related diseases [13, 66]. Corresponding with these results, a Dutch study revealed that 41% of sickness absences spells longer than 3 to 4 weeks in female workers, are attributed to psychological diseases, while in male workers about 40% of this spells can be attributed to physical diseases (comprising cardiovascular diseases, gastro-intestinal complaints, neurological diseases, urogenital complaints and lung diseases) [67].

The majority of studies investigating the relation between several health conditions, diseases and presenteeism come from the North-American school, which are mainly interested in the costs attributed to the productivity loss due to these diseases. A variety of diseases have been addressed in relation with presenteeism and related productivity loss, revealing some interesting findings. Schultz concluded in a review that not only mental health problems but also physical health conditions were found to be consistently related to decreased productivity [26, 47]. Physical health conditions associated with presenteeism include hypertension and cardiovascular disease, arthritis, diabetes and other metabolic disorders, chronic pain, migraines/headaches, cancer, respiratory tract diseases, and allergies. Psychological problems and diseases include anxiety, chronic fatigue, depression, nervousness, panic attacks, and low energy levels [63].

There are however limited number of studies that investigated the impact of health problems on presenteeism and sickness absence simultaneously. A small Canadian study suggested that being diagnosed with a chronic condition was a significantly better predictor of absenteeism than of presenteeism, while seeking psychological help and using counselling services were significantly better predictors of presenteeism than of absenteeism [68]. Another study demonstrated, that workers suffering from gastritis, insomnia or allergies choose to go to work despite their illness, while astma, blood pressure problems, thyroid diseases and emotional problems may force people to stay at home [50]. In any case, this expresses that the specific nature and the severity of the illness obviously have an impact on the decision making process leading to presenteeism or sickness absence.

**d) Personality characteristics**

The association between personality characteristics and attitude-related outcomes, such as job performance and job satisfaction, has been subject of investigation, while the association with sickness absence was less examined. In this context, it has to be mentioned that the personality theory is mostly dominated by the five-factor model, which assumes that five factors (often referred to as the "big five") are representing core personality characteristics or traits [69]. These "big five" personality characteristics are: neuroticism, extraversion, conscientiousness, agreeableness and openness. Generally, it was demonstrated that personality characteristics are playing an important role in sickness absence, with especially high neuroticism and low extraversion being related to sickness absenteeism [70]. Neuroticism is considered as a general tendency to experience a negative affect, such as fear, sadness, or anger [69], and is expected to be involved in the response to stressors [71]. Extraversion is a personality trait which is characterized by sociable, talkative, energetic behavior, and an open expression of impulses [69].

The importance of personality characteristics in the relation of psychosocial factors with health and behavioral outcomes, can also be derived from the fact that some well-established job stress models include an intrinsic feature of the worker. The Effort-Reward Imbalance (ERI)-model includes

overcommitment as an important feature to describe the relation between the psychosocial work environment and several outcomes [72]. Overcommitment can be defined as a personality trait, which is characterized by an extreme ambition and strong need to be esteemed, and is associated with an inappropriate reaction to work-related stressful situations and feelings. One of the hypotheses ( see also 1.2.2.) of the model is that a high level of overcommitment will also increase the risk for negative health outcomes. The overcommitment hypothesis was examined with regard to sickness absence, but no relation was found [73].

Until now, the association between personality and presenteeism was to a limited extent subject of investigation. Nevertheless, some authors mentioned the importance of psychological characteristics in this behavior. Individual boundarylessness, which is a personality trait that decreases the ability of a worker to say no to other peoples demands, has been associated with presenteeism [43]. Another study mentioned the importance of 'work ethics' as a reason for presenteeism [74]. Additionally, overcommitment [72] has been examined in relation with presenteeism, suggesting that a strong commitment to work will enhance the likelihood of presenteeism [44]. Finally, also neuroticism has been suggested to be an important personality trait in reporting presenteeism. However, results of studies examining this relation are inconsistent [18, 34, 75].

### 1.2.2. Work-related features as antecedents of attendance behavior: job quality

As described above, job quality includes both work quality and employment quality [76]. The relation between work quality, which comprises working conditions and work content related issues such as psychosocial job stressors, with sickness absence has been already extensively investigated, while the relation between the psychosocial work environment and presenteeism is less examined. Alongside, the association between employment quality, which includes employment conditions referring to the mutual agreement concerning working hours, wage and so on, and attendance behavior is also an emerging topic of investigation, since this aspect is especially affected by recent changes in the labor market [76].

**a) Work quality: the psychosocial work environment**

Work quality is generally composed of 2 components: working conditions and work content. Working conditions refer to the physical, biochemical and psychosocial exposures that are imposed to a worker. Work content generally represents the kind of tasks that have to be performed, with the related degree of autonomy a worker has to accomplish this task [76]. The health effects due to chemical, physical and biological agents are not specifically examined in this thesis, which is focusing on consequences of exposure to the psychosocial work environment.

*Job Demand Control-model and Effort-Reward Imbalance-model*

The most influential model investigating the impact of the psychosocial work environment on health and well-being, is the Job Demand Control (JDC)- model of Karasek, which has been introduced in the late seventies [77, 78]. Essentially, this two-dimensional model distinguishes job demands or the amount of work a worker has to do, and control or the discretion the worker has in how to deal with her or his work. The model assumes that especially high work demands in combination with low job control is associated with high psychological strain and subsequent health problems, which is labelled as the strain hypothesis. Later, the JDC-model was extended with a third dimension, which measures the amount of social support a worker is receiving from fellow workers and superiors [79]. Accordingly,

the model was referred to as the Job Demand Control Support (JDCS-) model. The 'iso-strain' hypothesis states that workers with high job strain and low social support have a higher risk to develop negative health effects. The Job Content Questionnaire (JCQ) was developed as an instrument with standardized questions, which assesses these specific dimensions of the psychosocial work environment [80].
Another widespread job stress model is the Effort-Reward Imbalance (ERI)-model of Siegrist [72]. Besides two external characteristics of the psychosocial work environment (effort and reward), an intrinsic feature of the worker (overcommitment) is included. Efforts include job demands or obligations which are imposed by the employer (performing work under time pressure, with frequent interruptions), while rewards comprise the salary, esteem (respect, recognition and support from both employer and co-workers) and occupational status (career opportunities, including job security). As mentioned above, overcommitment can be considered as a personality trait, characterized by a disproportionate reaction on stressful situations at work. The model hypothesizes that a lack of reciprocity between high efforts and low rewards will evoke emotional distress, which in turn can result in a stress reaction and negative effects on health and wellbeing. A second hypothesis is that a high level of overcommitment will also increase the risk for negative health outcomes. Finally, the third hypothesis states that an effort-reward imbalance in combination with a high degree of overcommitment will lead to the worst situation for health and wellbeing [72, 81].

A large amount of empirical studies have used these models to examine associations between the psychosocial working conditions and a variety of outcomes. Several studies, reviews and meta-analyses have demonstrated that workers perceiving job stress, defined by job strain or ERI, have a higher risk for mental disorders, depression and coronary heart diseases [82-89]. Previous studies also suggested a relation between job strain or ERI and musculoskeletal disorders, but generally results are less consistent [83, 90, 91].

The relation between **job strain and sickness absence** was less investigated, while the relation with presenteeism was seldom examined. Generally, there is limited support for the strain hypothesis in relation with future sickness absence [92, 93]. Several studies evaluated the relation of the separate dimensions of the JDCS-model (job demands, job control, social support) in relation with sickness absence. In their review, Allebeck et al [51] concluded that high job control was clearly associated with lower sickness absence, while high job demands are related to higher sickness absence in the majority of the studies [94, 95]. Finally, several studies suggested that low social support is associated with higher sickness absence [92, 96].
Research investigating the relation between several dimensions of **the JDCS-model and presenteeism** is scarce. Largely, a positive correlation between job demands (but also dimensions closely related to job demands, such as time pressure) and presenteeism has been demonstrated [30, 43, 48].
The relation between presenteeism and job control is however less clear. Generally, high control is considered as a risk factor for presenteeism, since control may reflect the possibility to adjust the work to the reduced capacities of the sick worker [45]. However, Aronsson and Gustafsson observed that low control over work pace was associated with presenteeism [43].
Supervisor support is a contextual factor that has been examined in earlier studies, but the precise nature of the relation with presenteeism remains unclear. Both high and a lack of social support have been proposed as a risk factor for presenteeism [97]. To our knowledge, no study has reported on testing the strain hypothesis with presenteeism as an outcome.

The **ERI-model** of Siegrist, has also been applied and several authors demonstrated that an imbalance between efforts and rewards increases the risk of **sickness absence** [98, 99].

Conversely, no studies described **the relation between ERI and presenteeism**, while overcommitment as an intrinsic feature of the employee, has been repeatedly associated with presenteeism [24, 44]. In this context, it has to be mentioned that several authors described a significant association between dimensions related to the characteristic 'efforts' (such as time pressure and job stress) and presenteeism [43, 48].

*Bullying*

Although both the job strain and ERI model put emphasis on dimensions referring to social work relations in explaining health and health problems, the aspect of an extremely negative feature of social interaction at work is not accounted for. Both models do not explicitly consider bullying, which is however a rather frequent phenomenon at the workplace. Generally, workplace bullying refers to the prolonged and repeated exposure to frequent aggressive and hostile behaviors at work, such as excessive criticism, withholding necessary information, spreading of rumors and social isolation [100]. Although a largely accepted definition of bullying is lacking in literature, there are consistencies between the most commonly applied definitions. There is general consensus that bullying consists of repeated negative acts towards one or more victims [100-103]. Some definitions explicitly mention the persistent and long-lasting nature of the behavior [102, 103], while others emphasize the imbalance of power between victim and perpetrator by referring to the difficulties a victim perceives to defend him of herself [100]. Notelaers describes bullying as a process, in which the victim becomes increasingly targeted and shows an inability to deal with the whole situation [104, 105]. Despite these minor variations in definitions, it is generally accepted that bullying is a serious problem, which can have major impact on employee well-being and health. Being a target of bullying has not only been repeatedly associated with psychological problems [106-109], but also physical problems and diseases have been attributed to bullying [109]. In this perspective, it is also worth mentioning that several authors recognize an association between bullying and a diversity of other dimensions of the psychosocial work environment (such as high workload [103, 110], low job control [110-112], role ambiguity [111], change at work [113], role conflicts [111]).

While numerous researchers have focused on the impact of the well-known job stress models on sickness absence, only a few authors [114-116] demonstrated that **bullying** prospectively increased the **risk for sickness absence**. Additionally, when investigating several psychosocial risk factors, bullying seems to have the strongest association with sickness absence [117]. Nevertheless, it should be noted that the majority of these studies were conducted in a restricted population consisting of healthcare workers.

To the best of our knowledge, the association between **bullying and presenteeism** has not yet been the subject of investigation. Within this context, it should be noted that the majority of researchers in this area adhere to the 'work environment hypothesis', which is essentially stating that a stressful and poorly organized work environment may give rise to conditions resulting in bullying. In this hypothesis, working in a stressful environment is considered being an antecedent of bullying. A few authors applied the JDC-model in order to explain the origin of bullying, which generally supported the strain hypothesis, revealing that the combination of high demands with low control leads to reports of bullying [112, 118-120].

*Work-family conflict*

Alongside the above described work quality factors closely related to work life, also some aspects reflecting the feasibility to combine work and family life may have impact on attendance behavior.

Work-family conflict (WFC) is defined as a form of interrole conflict in which the role pressures from the work and family domains are mutually incompatible in some respect [6]. In a large part of the

studies, the degree of exposure to household responsibilities is defined by using objective measures, such as the number of children or the number of hours spent in unpaid work [121-123]. Another approach is to measure work-family conflict by the subjective degree of conflict the worker perceives to combine work and family domains through questionnaires [18, 123-130].
Work-family conflict is reciprocal in nature, indicating that two directions are recognized: negative work to family interference (WFI) or the amount that work demands negatively interfere with the family role and negative family to work interference (FWI) or the amount that family responsibilities are hampering the work role. The importance of taking into account the specific direction of the conflict has been stressed by former researchers, indicating that the separate directions may differently impact on health and wellbeing [131, 132].

Several adverse outcomes have been associated with work-family conflict, such as job dissatisfaction, life dissatisfaction, but also health outcomes, such as burnout, fatigue, poor self-rated health and depression [129, 130, 132].

On the other hand, little attention has been paid to the relationship between work-family conflict and attendance behavior. A small amount of studies investigated the relation between **work-family conflict and sickness absence**. On the whole, WFI was associated with higher sickness absence in the majority of studies [125, 128, 133], while also some studies revealed work-family conflict (regardless the direction) as a risk for sickness absence [123, 126]. Contrary, evidence investigating the relation between the other direction, FWI, and sickness absence is not conclusive [127, 133]. Worth mentioning in this research area, is that the double burden (or the combined load of paid and family work) is hypothesized to explain the higher rates of sickness absence in women. However, research in this area leads to inconsisting results, and therefore does not confirm this hypothesis [123, 134, 135].

Research investiging the association between **work-family conflict and presenteeism** is very scarce: only Johns demonstrated that WFI is associated with presenteeism [18].

**b) Employment quality**

Although the prominent job stress models include some aspects of employment quality, such as subjective job insecurity, they generally do not pay a lot of attention to the particular effect of this aspect on health and well-being of the individual worker. Employment quality is referring to those employment conditions related to the mutual agreement concerning working hours, wage and so on [2, 5, 76].
During the past decades, working arrangements are moving from the traditional employment relationship into alternative, non-standard arrangements which are characterized by flexibility and insecurity [136]. The standard employment relationship, which is generally representing the stable, permanent full-time working arrangement, is generally considered as the 'good employment'. This type of arrangement is de-standardised and more and more replaced by jobs which are contemporary, with atypical working time arrangements and are characterized by more job instability and insecurity, less social protection and rights and lower material rewards (less pay) [137-139].
Several approaches to measure employment quality have been used in research. Basically, the objective and subjective approach can be distinguished. The objective approach investigates the consequences of being employed in a job, which can be objectively considered as an atypical contractual arrangement (eg. temporary contracts, working long hours, involuntary part-time employment, schedule unpredictability,..). The subjective approach emphasizes the worker's perceptions about the quality of their employment arrangements [140].

A variety of measures can be considered as indicators of low employment quality, but in the context of this doctoral thesis, we restrict our focus to job insecurity, precarious employment and long working hours.

*Precarious employment and job insecurity*

Although a lot of debate is going on about the definition in literature, precarious employment can be viewed as those atypical employment arrangements including a common characteristic of job and income insecurity. Typical employment arrangements which are referred to as precarious employment are casual, fixed term contracts; temporary workers; and self-employed subcontractors [141]. In this point of view, "**precarious employment**" may be used as an objective measure of job insecurity. Nevertheless, it should be noted that not everyone, who is working under a precarious employment arrangement, is perceiving this job insecurity. Some workers may intentionally opt for this kind of jobs for several reasons, consequently not causing this job insecurity perception. Therefore, some researchers use the subjective perception of job insecurity as an indicator of low employment quality.

A substantial part of the research demonstrated a significant association between precarious employment and health problems, while some investigators -in contrast- also found correlations with better health [140]. These conflicting findings possibly reflect differences in welfare systems or may be due to a healthy worker effect [136]. When applying the subjective measure "job insecurity" as an indicator of low employment quality, the association between job insecurity and adverse health outcomes is more consistent [140].

Precarious employment has been associated with a lower rate of absenteeism in several studies [94, 142, 143], while a positive association could be demonstrated between precarious contract and presenteeism [144]. Furthermore, it has been demonstrated that the change from fixed term to permanent employment was followed by an increase in medically certified sickness absence [145]. Studies investigating the effects of **job insecurity** on sickness absence are mostly conducted in situations of major downsizing, and revealed inconsistent results [146-149]. According to Blekesaune [146], the increase of absences due to job insecurity, is explained by the stress theory, which is basically stating that job insecurity causes stress and health problems. The decrease of absence rates can be explained by the healthy worker effect: unhealthy workers with frequent sickness absence will sooner end up in unemployment during economic recession periods. But also the disciplinary theory, assuming that workers perceiving job insecurity have fear to stay at home in case of illness, may be an explanation. This second theory is supported by evidence revealing a positive correlation between job insecurity and presenteeism [150, 151].

*Long working hours*

A third indicator of low employment quality, which is studied in this thesis is **long working hours**. Although different cut-off points are applied in research to define long working hours, this indicator is generally reflecting a de-standardized working time arrangement, which exceeds the standard working hours (which may slightly differ from country to country) [152]. An International Labor Organization (ILO) report estimated that about 22.0% of the workers globally were working >48h/week, indicating that this type of arrangement is a rather frequent phenomenon [153]. A recent review clearly demonstrated that long working hours are associated with depression, anxiety, sleep problems and coronary heart disease [152]. The association between long working hours and sleep problems was explained by the fact that those workers do not have enough time to recover from exhaustion [154]. Working long hours also decrease the time left for private and family responsibilities, which may lead to irregular lifestyles. This irregular lifestyle possibly results in sleeping problems and influences health behaviors. Sleeping problems (and lack of sleep) lead to depression[155], which is in turn a well-known risk factor for coronary heart disease [156].

Although long working hours have been associated with health problems, this indicator of low employment quality has been suggested being related with less sickness absence [157-160]. This may be explained by the feeling of work pressure that employees who are working long hours may perceive. They may feel a certain pressure to attend work during illness and perceive difficulties to take sickness absence [157, 158, 160]. This is confirmed by other research, revealing a positive association between long working hours and presenteeism [44].

## 1.3. Approaches to measure stress related to indicators of work quality: is hair cortisol a suitable biomarker?

In the paragraphs above, several indicators of job quality (which are considered as job stressors) were enumerated. Measurement of these job quality indicators are essentially based on questionnaires, which are for the majority of the indicators based on validated instruments.
In this context, it should be noted that there are several difficulties in measuring stress due to theoretical and methodological issues. Additionally, in epidemiological research, a job stress measurement method should be easy applicable and suitable on a large scale, which limits the possibilities for certain approaches.

Generally, three approaches to measure job stress can be distinguished, each measuring a separate aspect of the stressor-stress response.
First, **the environmental approach**, which is measuring the objective work environmental stressor or condition that may lead (both directly and indirectly) to health problems, diseases and related attendance behavior. The majority of the job stress models are examples of this approach and are based on the measurement of structural characteristics of the psychosocial work environment. They are also called interactional or structural job stress models [161].
A second method is **the psychological approach**, which also emphasizes the individual emotional and mental reaction of the stressor and therefore focuses on the interpretation of stressors [162]. Several job stress models also take into account this transaction between the individual and the work environment and are therefore described as transactional job stress models [161]. The ERI-model is an example of a transactional model, since it also considers overcommitment as an important feature leading to health problems [72].
Both the environmental approach and the psychological approach have in common that measurements are based on self-reported questionnaires, which have the advantage of easy applicability on a large scale. On the contrary, they include additional methodological challenges in validating questionnaires. Furthermore, when examining relations between job stress and behavioral outcomes (which are for the majority also based on self-reports), this aspect introduces a possible problem of common-method bias.
The third method, which is **the biological approach**, may overcome some of these problems, by examining the activation of biological systems in response to stressors. Since both the self-reported measures and the physiological stress response are indicators of the stressor, they are supposed to be highly correlated [163].
This psychological response provoked by stressors is assumed to be the linking bridge between stressor exposure and physiological outcomes [164].
As mentioned in paragraph 1.2.2, the exposure to a variety of stressors related to work quality and employment quality, has been associated with several adverse health effects, such as cardiovascular

problems, mental disorders and depression [82-89] and attendance behavior [18, 24, 43-45, 48, 51, 92-99, 114-117, 123, 125-128, 133]. Generally, two physiopathological pathways have been suggested in the connection between psychological stressors and health: the autonomic nervous system and the hypothalamic-pituitary-adrenal (HPA) -axis [165-167].

Consequently, a substantial amount of studies searching for a biomarker of stress, have focused on cortisol, representing the end hormone of the HPA-axis. Uptil now, cortisol was mainly measured in saliva or serum. The cortisol awakening response, assessed with a number of saliva samples during the morning, is often used as an indicator of HPA-axis activation. Several studies related this measure to psychosocial factors (as measures of work quality), revealing inconsistent results [168]. However, the measurement of this pulse of cortisol in the early morning is limited by a number of factors, such as the compliance of the participants and the need for several sampling days [169] ( see figure 1.4).

**Table 1** A comparison of properties of the various matrices for cortisol measurement.

| Property | Serum | Saliva | Urine | Hair |
|---|---|---|---|---|
| Subjective level of invasiveness associated with sample collection | High | Low | Moderate | Low |
| Cortisol affected by stress of sampling procedure? | Possibly | Possibly | Possibly | No |
| Storage requirements | Spinning and refrigeration followed by freezing | Refrigeration or freezing | Refrigeration or freezing | Room temperature; stable for years |
| Time periods of cortisol production represented | Single point measure | Single point measure | 12—24 h; integral of exposure | Months to years; integral of exposure |
| Affected by changes in cortisol binding globulin? | Yes; total cortisol measured | No; only free cortisol measured | No; only free cortisol measured | No; only free cortisol measured |
| Clinically relevant reference ranges established? | Yes | Yes | Yes | No |

**Figure 1.4.**: Comparison of properties of the matrices for cortisol measurement [170]

Therefore, the method developed by Raul [171], to measure the concentration of cortisol in hair (HCC) may be promising. It was demonstrated that hair provides a good matrix for the measurement of cortisol, reflecting retrospective cortisol secretion over longer periods of several months [171-175]. A number of studies established that HCC is a valid measure of the long-term secretion in pathological situations with abnormal cortisol levels due to aberrant adrenocortical conditions [173, 176, 177]. Additionally, a consistent positive association was revealed between HCC and pregnancy [172, 178], which is known to be a situation of increasing cortisol production across the successive trimesters.

This method may thus create opportunities for the use of HCC as a biomarker of stress-related conditions in psychobiological research. Several studies established the association between HCC and stress-related psychiatric disorders, such as posttraumatic stress disorder, depression and anxiety disorders, resulting into mixed results [179-182]. HCC was also examined in situations that are assumed to be stressful, such as long-term unemployment and chronic pain[183-186].
Besides the relation between HCC and stress-related conditions and disorders, the association with several questionnaire-based stress-measures was examined, revealing inconsistent results. The inclusion of subjective stress measures is an essential and important element of stress research: not

only the objective stressful event, but also the individual appraisal of the event and the ability to cope with the stressor, will impact the stress response and the reaction of the HPA-axis [187]. These inconsistent results are commonly explained by the discrepancy in the length of the hair sample and exposure period assessed by the questionnaire, or by recall bias or social desirability bias [188].

Although several authors applied this novel technique of HCC in their studies, the studies conducted in a working population, exploring the relation between an adverse psychosocial work environment and HCC are limited [189-191].

## 1.4. Aims and outline of the thesis

Although an important number of studies have investigated the relation of several aspects of job quality with health and productivity, there are still a number of important gaps in literature. Therefore, the general aim of this thesis is to improve insight into the relation between job quality, health and attendance behavior. The Chapters 3-9 present the different results: each chapter is based upon an independent paper which has been published or submitted in a peer-reviewed journal.

First, the majority of studies have investigated the relation between several aspects of work and employment quality with health (physical and psychological), while only a minority has focused on behavioral outcomes, such as sickness absence and presenteeism. Second, although the amount of research investigating determinants of attendance behavior is rapidly growing, some dimensions of job quality, such as bullying and work-family conflict remain less examined. Therefore, **a first major aim** was to investigate several **work-related factors** (both work quality and employment quality indicators, including factors that have gained less attention uptil now), in relation with **attendance behavior** (both presenteeism and sickness absence). This aim is further elaborated in Chapters 3- 6. The results of these studies are based on the Belstress III dataset (Chapter 3-5) and the fifth European Working Conditions Survey (Chapter 6).

Particularly presenteeism, as part of the attendance behavior, is a subject that merits more attention from researchers than it has received until now. In **Chapter 3**, **measures of work quality** were examined in relation with **presenteeism**. Several dimensions, based on the well-established JDCS-model and ERI-model were complemented with some less examined measures, such as both directions of work-family conflict and bullying in relation with presenteeism.

Furthermore, current studies mainly focused on the effects of several aspects of job quality on overall sickness absence, without specifying the cause of sickness absence. Nevertheless, examining the relation between aspects of job quality with cause-specific sickness absence will increase our insight in the attendance dynamic. Therefore, in **Chapter 4**, **measures of work quality** were examined in relation with **two types of cause-specific sickness absence**. Since mental and musculoskeletal diseases are leading causes of sickness absence, the prospective relation between these measures was examined with registered sickness absence due to mental diseases and sickness absence due to musculoskeletal problems.

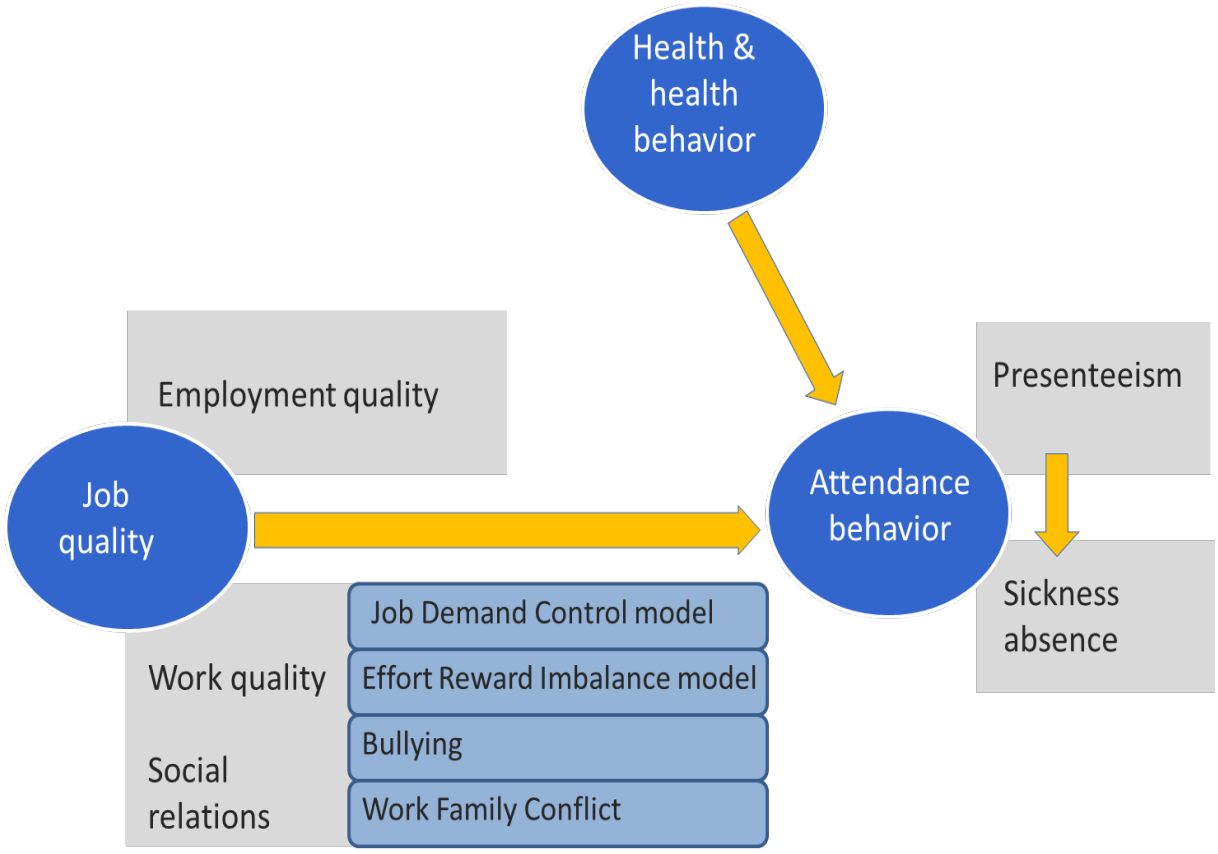


**Figure 1.5.**: Overview of study aims

Another aspect that needs further clarification is the specific interplay between particular aspects of work quality and attendance behavior. In **Chapter 5**, the objective was to get more insight into the **complex interplay between job strain and bullying** in relation with prospectively registered **sickness absence**. Based on the "work environment hypothesis", which essentially assumes that workplace bullying can be attributed to a stressful work environment [103, 110], a mediation model was developed to test the indirect effect of job strain on sickness absence through bullying, using structural equation modeling.

Finally, the specific relationship between several aspects of job quality in relation with attendance behavior is restricted to research that separately examine either sickness absence or presenteeism, ignoring the other aspect of the attendance dynamic. This shortcoming was addressed in **Chapter 6**, in which, **indicators of employment quality** were examined in relation **with attendance behavior, operationalized as several combinations of self-reported sickness absence and presenteeism**. This approach allows getting more insight into the interchange between absenteeism and presenteeism.

**The second goal** was to examine **the relation between Body Mass Index (BMI)** and both **presenteeism and sickness absence**. This aspect was further elaborated in chapter 7 and is based on the Belstress III dataset. The relation between Body mass index class ( normal weight, overweight and obesity) and both registered sickness absence and presenteeism was explored.

Presenteeism was repeatedly associated with negative health outcomes for the individual worker and productivity loss for the employer, but the association between the act of presenteeism and future

sickness absence has not been investigated thoroughly. Therefore**, a third aim** was to explore **the prospective relation between presenteeism and several measures of registered sickness absence**. This issue was also based on the Belstress III dataset and results are described in chapter 8. It allows to get more insight into the consequences of presenteeism on the individual health and sickness absence.

Finally, in order to overcome specific issues related to questionnaire based research, also the biological approach for measuring stress in the working environment was explored. Although a lot of researchers are searching for a suitable biomarker of stress, there is still not much research conducted to examine the feasibility to use hair cortisol as a biomarker of stress in the working environment. Therefore**, a fourth aim** was to examine the feasibility of using **hair cortisol as a biomarker of job stress** (related to several measures of work quality) in a sample of healthy Belgian workers. It was hypothesized that job stress measures are positively associated with HCC. This research question was examined on a pilot study particularly set up to investigate this question and is reported in Chapter 9.

| Term | Explanation |
|---|---|
| Job quality | A multidimensional concept containing several different aspects of work and employment which may impact on the well-being of workers [2]. |
| Work quality | Refers to all the attributes of the work itself and the working environment. Is related to the material characteristics of the task performed and the environment within which it is performed[2]. |
| Employment quality | Is related to the contractual relationship between employer and employee[2] (such as the employment contract, remuneration and working hours, and career development). |
| Social relations | Refers to these elements of work quality which are specifically related to the nature of social interactions. |
| Bullying | Refers to the prolonged and repeated exposure to frequent and hostile behaviors at work, such as excessive criticism, withholding necessary information, spreading rumors and social isolation[100]. |
| Work-family conflict | Occurs when there are incompatible demands between work and family roles[6]. |
| Precarious employment | A multi-dimensional construct characterized by temporality, powerlessness, limited benefits, and low earnings [192]. |
| Precarious contract | Fixed term contract or temporary employment agency contract. |
| Long working hours | There are many ways of defining long hours, but most researchers seem to focus on weekly hours of at least 48 hours based on the European Working Time Directive [193]. |
| Attendance behavior | An umbrella term which includes both presenteeism and sickness absence. |
| Job insecurity | An overall concern about the future existence of the job [194]. |
| Presenteeism | Attending work while ill [23]. |
| Absenteeism | Not showing up for work when scheduled [11]. |
| Sickness absence | Not able to attend work due to illness or weakened state of well-being [12, 13]. |

**Table 1.1.:** Overview of terms and definitions, used in this thesis

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# Chapter 2.

# Methodology

To investigate the study questions, three different datasets were used. Most study questions were tested using the Belstress III dataset, which is a study conducted in Belgium in 2004 with the aim to examine the determinants of sickness absence from work. Some aspects concerning the relation between specific features of employment quality and attendance dynamic were investigated in a large dataset from the Fifth European Survey on Working Conditions, a study conducted in Europe in 2010. Finally, the particular question about the applicability of a biomarker to measure job stress was applied in a pilot study, which was set up in two production companies in Flanders, between 2012 and 2014. In this chapter, more information is given about these three datasets. For each study, the study population is first described. Second, an overview is given about the most important variables, which were used in the papers presented in the following chapters. An overview of this information can be found in table 2.1.

| Dataset | Chapter | Dimension | Number of items | Cronbach's alpha |
|---|---|---|---|---|
| **Belstress III** | Chapter 3,4,5,7,8 | Job demands | 5 | 0.69 |
| | | Job control | 9 | 0.80 |
| | | Social support | 8 | 0.86 |
| | | Effort | 5 | 0.75 |
| | | Reward | 11 | 0.80 |
| | | Bullying | 9 | 0.90 |
| | | Strain based work family interference | 6 | 0.82 |
| | | Strain based family work interference | 6 | 0.83 |
| | | Physical demands | 5 | 0.90 |
| | | Problems in private life | 9 | 0.72 |
| | | Short Iowa scale of CES-D | 11 | 0.88 |
| | | Neuroticism | 12 | 0.86 |
| **European Survey on Working Conditions** | Chapter 6 | Precarious contract | 1 | |
| | | Job insecurity | 1 | |
| | | Long working hours | 1 | |
| **Cortisol pilot study** | Chapter 9 | Job demands | 5 | 0.73 |
| | | Job control | 9 | 0.82 |
| | | Social support | 8 | 0.80 |
| | | Emotional demands | 4 | 0.80 |
| | | Cognitive demands | 4 | 0.66 |
| | | Work-family conflict | 4 | 0.78 |
| | | Family-work conflict | 3 | 0.81 |
| | | Short Iowa scale of CES-D | 11 | 0.80 |

**Table 2.1.:** Overview of the studies and the dimensions used in the separate chapters.

## 2.1. The Belstress III study

### 2.1.1. Study design and population

The Belstress III study was a research project conducted in Belgium by the School of Public Health of the Free University of Brussels and the Department of Public Health of Ghent University, with support of the Belgian Federal Service of Employment, Labor and Social Dialogue and of the European Social Fund. The study was conducted in 2004 in three (semi-) public administrations (53.3% of the sample), three companies from the service sector (health care or social work) (38.9% of the sample), and one manufacturing company (7.7% of the sample).
The main objective of this study was to identify determinants for sickness absenteeism. All workers, in the age category between 30 and 55 years, within the participating companies, received a personal letter to invite them to participate in this study. A total of 2983 workers joined the study, which represented a response rate of 30.4%. The participants were asked to fill in a questionnaire with several standardized measures regarding health, health behaviors, job stress, stress outside work and personality. During one year from the day the questionnaire was filled in the sickness absence data were collected by the employee administration departments of the participating companies.
The Belstress III study was approved by the ethics committees of Ghent University and the Faculty of Medicine of the Free University of Brussels.

### 2.1.2. Measurements

**a) Questionnaire Data**

All participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health and health behaviors, characteristics of the psychosocial work environment and private life and information about attendance behavior.

*Socio-demographic and individual related variables*

Several individual and socio-demographic variables were questioned, including age, occupation, educational level, seniority (in the present firm) and sector.
Low educational level was defined as primary school level only, medium education as secondary school level and high education as high school or university. Occupations were defined according to the International Standard Classification of Occupations (ISCO) [1]. The sector, in which the worker was employed, was divided in the (semi-) public sector, social work and health care sector and the secondary sector comprising a manufacturing company.
In addition to these socio-demographic variables, a measure to assess the personality factor neuroticism, as an indicator of negative affectivity, was included in the questionnaire. Neuroticism was measured, using a scale, derived from the NEO Five-Factor Personality Inventory, consisting of 12 items [2].

*Health and health behaviors*

Respondents were asked about a number of health indicators and behavior, such as current smoking habits (yes/no), alcohol use (average number of units per day) and physical activity. Self-rated health was evaluated by the following question: ‘ How do you generally assess your health?’. This question was often applied in earlier research [3].

Workers were also questioned about their weight and height, which allows to calculate BMI.
The questionnaire also included a scale to measure symptoms of depression: the short Iowa scale of the Center for Epidemiological Studies-Depression scale was applied [4]. This scale consists of eleven items, assessing symptoms of depression during the last 2 weeks, of which the sum score was computed.
To assess the presence of low back problems, the workers were also questioned about the total number of days, they perceived low back pain during the last year.

*Psychosocial Working Environment factors*
The standardized JCQ, based on Karasek's JDCS-model, was applied to assess the work-related psychosocial factors [5].
Job demands were composed of the sum score of five items that relate to mental work load, organization constraints on task completion and conflicting demands. Job control was composed of the sum score of two subscales: 'skill discretion' consisted of 6 items referring to the level of skill and creativity required on the job and 'decision authority' was composed of 3 items concerning the possibilities for workers to make decisions about their work. The third dimension of social support at the workplace also consisted of the sum score of two subscales each containing 4 items: 'supervisor support' and 'coworker support'. In some of the papers, dichotomous variables were created for demands, support and control, based on the median values, in line with earlier studies in this research [5]. In Chapter 5, a measure for job strain was created, using the ratio of job demands over job control.
Besides the JDCS-model, also the ERI-model of Siegrist [6] was included in the Belstress III questionnaire, to assess the psychosocial work environment. Effort was assessed by the sum score of five items, measuring demanding aspects of the work environment. Reward was measured by the sum score of eleven items, containing financial reward, esteem, career opportunities and job security. Bullying was questioned using nine items, based on the scale of Quine [7]. Three items refer to "isolation", four items assessed the dimension "destabilization", while the dimension "threat to personal standing" was measured using two items.
To assess WFC, two measures based on the questionnaire developed by Kelloway et al. were used [8]. Strain based work family interference, or the amount that work interferes with the responsibilities at home and family work interference, or the amount that the private life interferes with work were measured. Both constructs were defined by the sum score of six items.
Besides these standardized scales, the questionnaire also contained a question assessing the flexibility toward the start and ending of their working day.
Next to the psychosocial working environment, which is more related to work content, also the dimension physical demands which is more related to working conditions is questioned. Five items from the Job Content Questionnaire [5] were included to assess the level of physical demands.

*Factors related to private life*
To evaluate the amount of stress outside work, a nine-item based scale regarding problems in private life was used [9].

*Attendance behavior*
The measure of presenteeism was based on a single question that assessed how often employees came to work despite being ill during the last year. This question has been applied in earlier research on presenteeism [10-14]. There were 4 possible response categories: 'never', 'one time', '2 to 5 times', 'more than 5 times'. In the papers based on this dataset, we considered persons who reported that they came working despite being ill at least 2 times during the past year as showing presenteeism, which in line with several other authors [10, 11, 14].

The respondents were questioned about their sickness absence, both the total number of sickness absence days, the total number of sickness absence episodes and the episodes of longer sickness absence ( > 15 days) within the previous 12 months.

**b) Prospective sickness absence data**

The objective sickness absence data were collected prospectively during 12 months follow-up, starting from the day on which the questionnaire was filled out. The registered data were obtained from the personnel administration departments of the participating companies.

In Belgium, sickness absence is strictly ruled under law and requires medical certification. Sickness absence data are also gathered for purposes of paying wages. Therefore, we consider these data as being both a reliable and a valid measure. Complete sickness absence data could be gathered for 2876 participants. Maternity leave was not included in these sickness absence data. 107 were lost during follow-up, mainly due to resignation or dismissal. Several ways of operationalization of sickness absence data have been described. Most commonly used are time lost absence ( total number of days absent) and indices of absence frequency (number of times absent) [15]. Several authors also make the explicit distinction between long-term absence and short-term absence: short-term sickness absence and high absence frequency are assumed to be more related to attitude, while long-term sickness absence is suggested to be particularly related to ill health and inability to perform work tasks [16, 17].

In this thesis, several ways of operationalization are applied. A long spell of sickness absence was defined as at least 15 consecutive days of sickness absence during the follow-up period, while a short spell of sickness absence was defined as a spell between 1 and 3 days. High sickness absence frequency was defined as a minimum of 3 sickness absence episodes during follow-up; this corresponded to the upper quintile of the sample. Finally, also a measure which includes sickness absence duration, irrespective of the frequency or the number of days per spell, was applied. Therefore, the upper tertile of the distribution of the total annual sickness days was used as cut-off to classify the workers with a high sickness absence duration. Thus, persons who were at least 10 days absent in the registered period, were classified as having high sickness absence duration.

In case of long-term sickness absence episodes of at least 15 consecutive days, the cause was retrieved by contacting the general practitioner of the worker, with her/his permission. A total of 522 long-term sickness absence episodes were registered, of which the reason could be acquired in 290 cases. Among these cases, 95 were classified as long-term sickness absence due to mental health problems (LSA-MH) and 85 were categorized as long-term sickness absence due to musculoskeletal disorders (LSA-MSD).

The majority of the LSA-MH cases concerned depression. The LSA-MSD mainly included low back disorders, repetitive strain injuries of the upper limbs and neck disorders.

### 2.1.3. Descriptive results

Table 2.2 demonstrates that the mean age of the study sample is 43,3 years. The sample is rather highly educated. Further, it should be noted that the majority of men were working in the public sector, while women were mostly employed in health care and social sector. Almost 50% of the study sample went working through illness on at least 2 occasions during the past 12 months.

Additionally, table 2.2 shows that the proportion of women with sickness absence was significantly higher than men. Long-term sickness absence was defined as an episode of sickness absence of at least 15 consecutive days. About 18% of the sample had at least one episode of long-term sickness absence

during follow-up. Frequent sickness absence was defined as at least 3 episodes of sickness absence (irrespective the duration of the episode). Almost 20% of the study sample was frequently absent during the follow-up.

| Variables | Total sample (n=2983) | Men (n=1372) | Women (n=1611) | *p*, gender difference[a] |
|---|---|---|---|---|
| **Mean age: years ( SD)** | | | | |
| | 43. 3 (6.7) | 43.5 (6.7) | 43.2 (6.8) | 0.12 |
| **Educational level: % (n)** | | | | |
| Low | 20.8 (617) | 25.8 (353) | 16.5 (264) | |
| Medium | 34.7 (1031) | 34.2 (467) | 35.2 (564) | <0.001 |
| High | 44.5 (1323) | 40.0 (547) | 48.4 (776) | |
| **Sector: % (n)** | | | | |
| Public sector | 53.3 (1591) | 72.0 (988) | 37.4 (603) | |
| Health care and social sector | 38.9 (1161) | 16.5 (227) | 58.0 (934) | <0.001 |
| Secondary sector | 7.7 (231) | 11.4 (157) | 4.6 (74) | |
| **Presenteeism: % (n)** | | | | |
| Never | 19.6 (576) | 24.7 (335) | 15.3 (241) | <0.001 |
| 1 time | 29.7 (872) | 30.3 (411) | 29.3 (461) | |
| 2- 5 times | 42.5 (1246) | 39.5 (537) | 45.0 (709) | |
| >5 times | 8.1 (239) | 5.5 (75) | 10.4 (164) | |
| **Variables** | **Total sample (n=2876)** | **Men (n=1315)** | **Women (n=1561)** | ***p*, gender difference[a]** |
| **Absence: % (n)** | | | | |
| No | 38.6 (1111) | 43.8 (576) | 34.3 (535) | |
| Yes | 61.4 (1765) | 56.2 (739) | 65.7 (1026) | <0.001 |
| **Long-term absence: % (n)** | | | | |
| No | 81.8 (2354) | 84.9 (1116) | 79.3 (1238) | |
| Yes | 18.2 (522) | 15.1 (199) | 20.7 (323) | <0.001 |
| **Frequent absent: % (n)** | | | | |
| No | 80.2 (2307) | 82.4 (1084) | 78.4 (1223) | <0.01 |
| Yes | 19.8 (568) | 17.6 (231) | 21.6 (337) | |

[a] results of t-test or chi square test

**Table 2.2.:** Description of some main characteristics and objective sickness absence data of the Belstress III study population

## 2.2. The European Working Conditions Survey (EWCS)

### 2.2.1. Study design and population

The European Working Conditions Survey (EWCS) is funded, designed and coordinated by the European Foundation for the Improvement of Living and Working Conditions, an autonomous agency of the European Union, which mainly collects data and knowledge to support policy makers to improve living and working conditions of European inhabitants.
The questionnaire is designed by experts and policy makers in the area of work and employment, in collaboration with the researchers of the European Foundation for the Improvement of Living and Working Conditions, in order to guarantee a valid and reliable measurement instrument. Additionally, the Foundation proposes the main sampling rules and fieldwork approach. Hereafter, the finalization of the design and the fieldwork itself is carried out by a research company (Gallup), under the supervision of the staff of the Foundation.

The fifth EWCS was carried out between January and June 2010 [18] and uses face-to-face questionnaires at the participants' own home to gather information on working conditions and employment in countries in Europe. The survey is representative of all employed or self-employed residents of the countries, aged 15 years of older. In each country, a multistage, stratified, random sample was drawn. In each stratum, the sample size was proportional to the number of persons in employment according to the latest Labor Force Survey publication on the Eurostat website or national sources for those countries not covered by the Eurostat system. The target number of interviews was at least 1000 in all countries. The samples were stratified by geographic regions and urbanization level. The actual selection of households is done by the random walk method, and within the selected household one employed individual is randomly selected. Further details on sampling design, methods and questionnaire are available elsewhere[18].
The survey includes information of almost 43.816 employed and self-employed workers aged 15 years and over within 34 countries (the EU27, Norway, Croatia, the former Yugoslav Republic of Macedonia, Turkey, Albania, Montenegro and Kosovo). The overall response rate was 44% for the fifth EWCS.

For the purpose of the paper presented in Chapter 6, persons who were not employed or self-employed were excluded. The analysis was restricted to a dataset of 28.999 employed workers from the 27 countries from the European Union.

### 2.2.2. Measurements

*Attendance behavior*
In Chapter 6, in which the paper based on the EWCS is presented, the concepts of presenteeism and sickness absence are combined, in order to get more insight in the complex decision making process of the ill worker. Therefore, the variable attendance behavior was operationalized as the combination of self-reported sickness absence and self-reported presenteeism, based on the approach of Gustafsson et al. [19]. Self-reported sickness absence was measured using one question: "Over the past 12 months how many days in total were you absent from work for reasons of health problems?" The results were dichotomized into no absence (no) and at least one day of absence (yes). Self-reported presenteeism

was assessed using the question: "Over the past 12 months did you work when you were sick?" The results also represented a binary variable (yes/no).
From these two dichotomous variables, a combined variable for attendance behavior was created, with four categories: no presenteeism/no absenteeism; presenteeism /no absenteeism; absenteeism/no presenteeism; absenteeism/presenteeism.

*Indicators of low employment*
Long working hours was defined as working more than 48 hours/week, based on the European Working Time Directive [20], aiming to protect workers from health and safety risks associated with excessive and inappropriate working hours.

The precarious contract variable was created based on the answers to the question "What kind of employment contract do you have?" Workers with a fixed term contract or temporary employment agency contract were defined as having a precarious contract, and were compared to those with an indefinite contract. Those with an apprenticeship or other training scheme or without a contract were excluded.

Job insecurity was measured using the item "I might lose my job in the next 6 months". Those who positively answered on this question were considered as perceiving job insecurity.

### 2.2.3. Descriptive results

Table 2.3 demonstrates that mean age of this sample was 41.7 years. The majority of the sample was employed in the private sector, while about 17% was self-employed.

| Variables | Total sample (n=43816) | Men (n=21035) | Women (n=22781) | *p*, gender difference[a] |
|---|---|---|---|---|
| **Mean age: years (SD):** | | | | |
| | 41.7 (12.2) | 41.6 (12.4) | 41.8 (11.9) | 0.07 |
| **Age when full-time education was stopped: years (SD):** | | | | |
| | 20.8 (9.8) | 20.6 (9.7) | 21.1 (9.9) | <0.001 |
| **Sector: % (n)** | | | | |
| Private sector | 67.1 (29172) | 73.3 (16604) | 60.3 (12568) | |
| Public sector | 25.9 (11278) | 20.3 (4594) | 32.1 (6684) | <0.001 |
| Joint private-public company | 3.7 (1623) | 3.8 (870) | 3.6 (753) | |
| Non-for-profit sector | 1.3 (549) | 0.8 (190) | 1.7 (359) | |
| Other | 2.0 (865) | 1.7 (382) | 2.3 (483) | |
| **Employment status: % (n)** | | | | |
| Self-employed without employees | 11.9 (5192) | 14.5 (3288) | 9.1 (1904) | <0.001 |
| Self-employed with employees | 5.0 (2182) | 6.9 (1561) | 3.0 (621) | |
| Employed | 80.4 (35187) | 76.2 (17333) | 85.0 (17854) | |
| Other | 2.7 (1188) | 2.5 (569) | 2.9 (619) | |

[a] results of t-test or chi square test

**Table 2.3.:** Description of some main characteristics of the EWCS study population

## 2.3. The hair cortisol pilot study

### 2.3.1. Study design and population

The participants consisted of a convenience sample recruited from 2 production companies in Flanders. First, some explanation about the purpose and procedure of the study was provided to the employees, by e-mail letters and written periodical information brochures. Participation was on voluntary basis, and those workers who gave their informed consent were asked to fill in a questionnaire. Depending on their preference, they received a link to an online survey or a paper version of the questionnaire. Workers were also given an appointment to obtain the hair samples and anthropometric measures.
A total of 146 workers volunteered in the study, representing 15 % of the workers of the 2 companies. Although a reminder was sent, valid questionnaire data were obtained from only 141 workers (116 used an online survey, the others filled in the printed form) and a total of 132 hair samples were collected.
This study received approval by the Ethics Committee of the Ghent University Hospital.

### 2.3.2. Measurements

**a) Questionnaire data**

All participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and work-related psychosocial stressors. Work-related psychosocial factors (as a measure of work quality) were assessed using the JCQ based on the JDCS-model [5]. The questionnaire is already extensively described in Chapter 2.2.2. Both emotional demands and cognitive demands, and also work-family and family-work conflict were dimensions from the Copenhagen Psychosocial Questionnaire, which is a questionnaire aiming to cover a broader range of psychosocial risk factors at work [21]. Both emotional and cognitive demands were composed of 4 items, and were scored on a 5-point Likert scale. The dimensions work-family conflict and family-work conflict consisted respectively of 4 and 3 items, which have to be scored on a 4-point scale.

For the measurement of symptoms of depression, the same scale as applied in the Belstress III study was used [4].

Several possible confounding factors were assessed such as age, educational level, smoking, alcohol use and suffering from chronic diseases. Educational level was defined in the same manner as it was in the Belstress III.

**b) Hair cortisol measurement**

Hair samples were cut from the vertex posterior with a scissor as close as possible to the scalp. The cortisol content was determined by high performance liquid chromate-tandem mass spectrometry. More details about this laboratory technique can be found in Chapter 9.

**c) Anthropometric measures**

Waist and hip circumference, weight and height were measured with light indoor clothing without shoes by trained researchers. These measurements were performed in the workplace of the participants.

### 2.3.3. Descriptive results

Table 2.4 demonstrates that mean age of the sample was 41.8 years. Significantly more women were highly educated than men. The male study population consisted for more than 50% of blue collars, while the majority of the female study population were white collars.

| Variables | Total sample (n=141) | Men (n=91) | Women (n=50) | *p*, gender difference[a] |
|---|---|---|---|---|
| **Mean age: years (SD):** | | | | |
| | 41.8 (10.5) | 40.7 (11.3) | 44.0 (8.7) | 0.05 |
| **Educational level: % (n)** | | | | |
| Low | 7.8 (11) | 11.0 (10) | 2.0 (1) | <0.001 |
| Medium | 39.7 (56) | 49.5 (45) | 22.0 (11) | |
| High | 52.5 (74) | 39.6 (36) | 76.0 (38) | |
| **Occupational status: % (n)** | | | | |
| Blue collar | 34.3 (48) | 52.2 (47) | 2.0 (1) | |
| White collar | 32.1 (45) | 10.0 (9) | 72.0 (36) | <0.001 |
| Executives | 33.6 (47) | 37.8 (34) | 26.0 (13) | |

[a] results of t-test or chi square test

**Table 2.4.:** Description of some main characteristics of the pilot study population of the hair cortisol project

## 2.4. References


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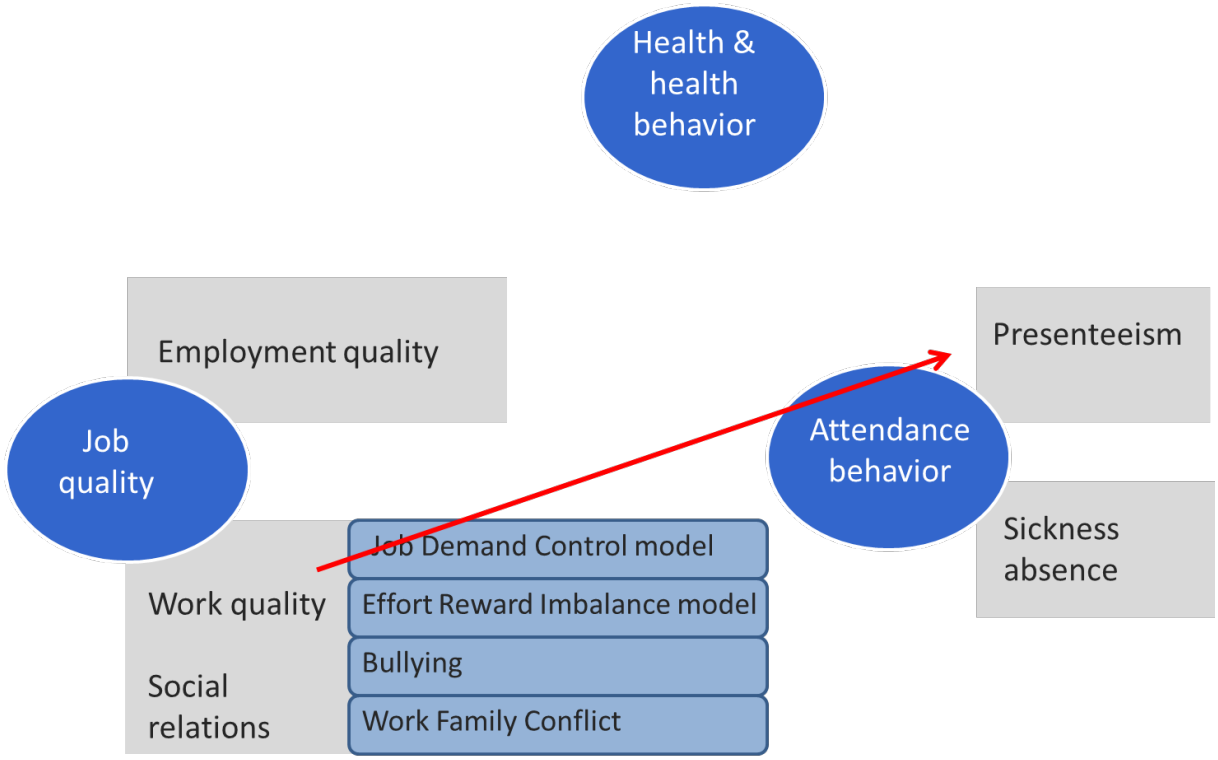
# Chapter 3.
# Relation between work quality and presenteeism




Based on :

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# ABSTRACT

## Objectives:

This study aimed to investigate the cross-sectional relation between psychosocial factors and presenteeism in a sample of Belgian middle-aged workers.

## Material and Methods:

Data were collected from 1372 male and 1611 female workers in the Belstress III study. Psychosocial factors assessed through self-administered questionnaires were job demands, job control, social support, efforts, rewards, bullying, home-to-work conflict and work-to-home conflict. Presenteeism was measured using a single item question, and defined as going at work despite illness for at least 2 times during the preceding year. Logistic regression models were used to investigate the relationship between psychosocial factors and presenteeism, while adjusting for several socio-demographics, health-related variables and neuroticism. An additional subgroup analysis in a selection of workers with good self-rated health and low neuroticism was conducted.

## Results:

The prevalence of presenteeism was 50.6%. Overall results, adjusted for major confounders, revealed that high job demands, high efforts, low support and low rewards were associated with presenteeism. Furthermore, a significant association could be observed for both bullying and work-to-home conflict in relation with presenteeism. The subgroup analysis on a selection of workers with good self-rated health and low neuroticism generally confirmed these results.

## Conclusion:

Both job content related factors as well as work contextual psychosocial factors were significantly related to presenteeism. These results suggest that presenteeism is not purely driven by the health status of the worker, but that psychosocial work factors also play a role.

## 3.1. Introduction

Presenteeism is an employee behavior that received increasing interest from several investigators in the field of workplace health, stress and productivity during the last decades. Following the European behavioral approach, presenteeism refers to the phenomenon when a worker turns up at work despite feeling so ill that he or she judges that sick leave would have been appropriate [1]. Another approach is followed by researchers mainly in the US and generally focuses on the productivity loss as a consequence of this specific behavior [2]. Prevalence figures of presenteeism are not consistent and vary between studies, ranging from 27% to 88%, depending on the type of applied questionnaire [3-5]. Overall, presenteeism can be considered as a rather widespread behavior among employees.

Presenteeism has been demonstrated to harm the health of the employee, which is- according to the allostatic load hypothesis [6]- probably caused by accumulated tiredness resulting from inadequate recuperation from illness [7]. Prospective studies found that sickness presenteeism was an independent risk factor for future poor general health and physical complaints [8, 9] but also for mental health problems, exhaustion and burnout [10-14]. Some authors additionally observed a prospective relation between presenteeism and sick leave, indicating that attending work while ill may be a risk factor for future absenteeism [15, 16]. Besides these negative consequences for the individual worker, also the economic impact of presenteeism has been a subject of investigation. Generally, presenteeism involves that the worker is not able to work at full capacity and is consequently associated with productivity loss for the employer. A number of researchers made a calculation of costs related to presenteeism and some have suggested that these costs even exceed those associated with sickness absence [17, 18].

Since presenteeism includes negative consequences for both the individual employee and the employer, it is important to define clues for direction of preventive measures. Besides the health status of the employee, which apparently has been demonstrated to be an important determinant of this behavior [3, 19], several authors focused on identifying work-related psychosocial factors associated with high rates of presenteeism. Earlier research mainly focused on job content related risk factors, such as job demands [20], time pressure [5, 21] and low replaceability [1, 3, 5, 22], which were all demonstrated to be positively correlated with presenteeism. Also job insecurity [23] and mismatch between desired and actual working hours [22] were risk factors for presenteeism. The relation between presenteeism and job control is however less clear. Generally, high control is considered as a risk factor for presenteeism, since control may reflect the possibility to adjust the work to the reduced capacities of the sick worker[24] . However, Aronsson and Gustafsson observed that low control over work pace was associated with presenteeism [5].
Work contextual factors have been addressed to a lesser extent in relation with presenteeism in previous research. Supervisor support is a contextual factor that has been examined in earlier studies, but the precise nature of the relation with presenteeism remains unclear. Both high and lack of social support have been proposed as a risk factor for presenteeism [25].
To the best of our knowledge, the association between presenteeism and bullying, which can be seen as a more extreme negative psychosocial contextual work situation, has not been thoroughly investigated yet. Former research revealed that bullying was a risk factor for sickness absence [26-28], and bullying was also demonstrated as a risk for several health problems [29-31]. In contrast, results about the relation between this psychosocial factor and presenteeism are restricted to a short report from the Fifth European Survey on Working conditions, which revealed a positive association between bullying and presenteeism [32]. Another emerging psychosocial factor, which has not yet been intensively studied

in relation with presenteeism, is work-family conflict. Theoretically, two directions in work-family conflict are recognized: work-to-home conflict or the amount that work demands negatively affect the family role and home-to-work conflict or the amount that family responsibilities are hampering the work role. Although earlier studies demonstrated that both work-to-home and home-to-work conflict caused distress and therefore were related to health problems, the relation with attendance behavior is less investigated. Home-to-work conflict has been revealed as a risk factor for sickness absence [33], while Johns [34] demonstrated in a small study sample that only work-to-home conflict predicted presenteeism.

This study aimed to contribute to the existing literature on psychosocial determinants of presenteeism, by investigating the cross-sectional relation of several psychosocial factors with presenteeism in a group of Belgian workers, adjusting for several health-related and personality variables. In addition to more commonly investigated factors based on the widespread Job Demand-Control-Support (JDCS) [35] and Effort-Reward Imbalance (ERI) [36] models, we also investigated the relation with more emerging work contextual risk factors relating to bullying and work-family conflict.

## 3.2. Material and methods

### 3.2.1. Study population

The relationship between psychosocial factors and presenteeism was examined within the Belstress III study [33]. This study was conducted in seven companies or public administrations across Belgium in 2004. All workers aged 30 to 55 years received a personal letter inviting them to volunteer. A total of 2983 workers joined the study, indicating a response rate of 30.4%. Analysis of the non-respondents revealed no important differences regarding age and gender [37].
The study population consisted of 1372 men (46%) and 1611 women (54%) who were employed within three (semi-)public administrations (53% of the sample), three companies from the service sector (health care or social work) (39% of the sample) and one manufacturing company (8% of the sample). The majority of the participants (72%) worked full-time.
The Belstress III study was approved by the ethics committees of the University of Ghent and the Faculty of Medicine of the Free University of Brussels.

### 3.2.2. Data collection

Data were collected using a self-administered questionnaire, including standardized measures for individual and socio-demographic variables, health behaviors and characteristics of the psychosocial work environment.

*Dependent variable:*
The measure of presenteeism was based on a single question assessing how frequent employees came working despite illness during the last year. Response categories were : ‘never’, ‘1 time’, ‘2 to 5 times’, ‘more than 5 times’. Persons who reported that they came to work despite being ill 2 to 5 times or more during the past year were considered as demonstrating presenteeism, following earlier research in this field [3, 5, 38].

*Independent variables:*

Work-related psychosocial factors were assessed based on the JDCS- [35] and the ERI-model [36], using 4-point Likert items. Job demands consisted of five items, which relate to mental work load, organization restrictions on task completion and conflicting demands. An example item is: "My job requires that I work very fast". The Cronbach's alpha of this scale was 0.69. Job control was composed of the sum score of nine items and consisted of two subscales: skill discretion or the level of skill and creativity required on the job and decision authority or the possibilities for workers to make decisions about their work. An example item is: "My job allows me to take my own decisions". The Cronbach's alpha of the job control scale was 0.80. The third dimension of social support at the workplace also consisted of the sum score of two subscales, each containing 4 items: supervisor support and coworker support. An example item is: "My supervisor is concerned about me". The Cronbach's alpha of the social support scale was 0.84. Effort was assessed through five items, measuring demanding aspects of the work environment. An example item for this scale is: " I am often pressured to work overtime". The Cronbach's alpha of this scale was 0.75. Reward was measured by eleven items, containing financial reward, esteem, career opportunities and job security. An example item is: " My job promotion prospects are poor". The Cronbach's alpha of the rewards scale was 0.90. Bullying was questioned using nine items mainly referring to isolation, destabilization and threat to personal standing, based on the scale of Quine [39]. An example item is: "At my work, necessary information is withheld from me". The Cronbach's alpha of the bullying scale was 0.90. Response categories on every question were: "yes, absolutely", "rather yes", "rather no", "absolutely not". To assess work-family conflict, two measures based on the questionnaire developed by Kelloway et al. were used [40]. Strain based work-to-home conflict (WHC), or the amount that work interferes with the responsibilities at home (example item: " I have to change family plans due to demands at work") and home-to-work conflict (HWC), or the amount that the private life interferes with work (example item: " My day at work is regularly interrupted by family duties") were measured. Both constructs were defined by the sum score of six items, which were each scored with five response categories. The Cronbach's alpha was respectively 0.82 and 0.83 for the WHC and HWC scales. Since psychosocial variables demonstrated a skewed distribution and for improving interpretability of the results, dichotomous variables were created. For all psychosocial factors, except for bullying, the median split procedure with medians included in the higher scores was applied, in line with earlier studies in this research domain [35]. Given that the median of the bullying scale corresponds to 12, which is a low score on a range between 0 (no bullying) and 36 (extreme bullying), we defined the upper quartile of the distribution as those being a victim of bullying, which is also more consistent with the prevalence of bullying reported in literature [41].

*Confounding factors:*

Several individual and socio-demographic variables were questioned, including age, gender, educational level and work sector. Low educational level was defined as completing the primary school or incompleted secondary school, medium education was defined as completing secondary school and high education as completing high school or university. Sector was divided in the (semi-) public sector, social work and health care sector and the secondary sector comprising a manufacturing company. A question regarding seniority in the present firm was included in the survey ($\leq$ 5 years/ > 5 years).

Respondents were questioned about several health indicators and behaviors, such as current smoking habits (yes/no), self-reported weight and height and self-rated health. Body Mass Index (BMI) was calculated as weight divided by the squared height (kg/m²). Self-rated health was evaluated by the

following question: 'How do you generally assess your health?', with 5 response categories. The variable was dichotomized: very good or good versus average, bad or very bad.
To evaluate the amount of stress outside work, a nine-item based scale regarding problems in private life was used [42]. The worker indicated on a 4- point Likert scale how often she or he had to deal with the following problems during the last month: financial problems, relational problems with partner, problems with children, relational problems with family and friends, health problems in family, problems with child care, problems related to transport, sexual problems, other problems outside work. A sum score was calculated, with lower scores meaning less problems outside work.
Neuroticism, as an indicator of negative affectivity, was measured using a scale derived from the NEO Five-Factor Personality Inventory, consisting of 12 items [43]. Respondents were asked to rate on a five-point Likert-type scale, the extent to which each statement corresponded to their perception of themselves.

### 3.2.3. Statistical analyses

Chi² tests or t- tests were conducted to assess the gender differences in socio-demographics, health behaviors and psychosocial work characteristics.
The relation between psychosocial factors and presenteeism was examined using multiple logistic regression analysis. In the first model, crude odds ratios with 95% confidence intervals were calculated. In the next step, the odds ratios were adjusted for several confounders, which are known risk factors for presenteeism. The following covariates were considered: age, gender, educational level, stress outside work, neuroticism, sector, seniority and several health-related confounders (smoking, BMI and self-rated health). In a third multiple model, all psychosocial factors were entered simultaneously. Finally, an additional subgroup analysis was conducted on a selection of workers with good self-rated health and low neuroticism, defined as the lower 75% of the distribution on the neuroticism scale. This procedure was followed, since preliminary analyses revealed that workers with bad self-rated health and high neuroticism reported significantly more presenteeism. This allowed getting a more precise idea about the strength of the associations. No significant interaction effects were observed between psychosocial factors and gender in the relation with presenteeism. Therefore, the analyses were not stratified for gender.
Models were screened for multicollinearity according to the calculation of Variance Inflation Factors, which revealed no problems. All models were evaluated at 5% significance level ($p < 0.05$). Data processing was performed using SPSS 21.0 software.

## 3.3. Results

Description of socio-demographic variables, presenteeism, health-related variables and psychosocial variables is presented in table 3.1. About 50% of the workers reported to come working despite illness 2 to 5 times or more during the past year. Women reported significantly more presenteeism, high job demands, low control, high WHC and HWC, while men reported more bullying.

| Variables | Total sample (n=2983) | Men (n=1372) | Women (n=1611) | *p*, gender difference[a] |
|---|---|---|---|---|
| **Mean age: years (SD)** | 43. 3 (6.7) | 43.5 (6.7) | 43.2 (6.8) | 0.12 |
| **Educational level: %(n)** | | | | |
| Low | 20.8 (617) | 25.8 (353) | 16.5 (264) | |
| Medium | 34.7 (1031) | 34.2 (467) | 35.2 (564) | <0.001 |
| High | 44.5 (1323) | 40.0 (547) | 48.4 (776) | |
| **Sector: %(n)** | | | | |
| Public sector | 53.3 (1591) | 72.0 (988) | 37.4 (603) | |
| Health care and social sector | 38.9 (1161) | 16.5 (227) | 58.0 (934) | <0.001 |
| Secondary sector | 7.7 (231) | 11.4 (157) | 4.6 (74) | |
| **Smoking: %(n)** | 27.6 ( 816) | 27.8 (380) | 27.3 (436) | 0.76 |
| **Neuroticism: %(n)** | | | | |
| low | 76.7 (2272) | 83.3 (1140) | 70.9 (1132) | <0.001 |
| high | 23.3 (692) | 16.7 (228) | 29.1 (464) | |
| **Mean BMI: kg/m² (SD)** | 25.2 (4.1) | 25.9 (3.5) | 24.5 (4.4) | <0.001 |
| **Self-rated health: %(n)** | | | | |
| Good/very good | 67.9 (1995) | 70.4 (954) | 65.8 (1041) | <0.01 |
| Average/bad/very bad | 32.1 (943) | 29.6 (401) | 34.2 (542) | |
| **Seniority: %(n)** | | | | |
| ≤5 years | 11.0 (328) | 8.7 (119) | 13.1 (209) | <0.001 |
| >5 years | 89.0 (2642) | 91.3 (1250) | 86.9 (1392) | |
| **Presenteeism: %(n)** | | | | |
| Never | 19.6 (576) | 24.7 (335) | 15.3 (241) | <0.001 |
| 1 time | 29.7 (872) | 30.3 (411) | 29.3 (461) | |
| 2- 5 times | 42.5 (1246) | 39.5 (537) | 45.0 (709) | |
| >5 times | 8.1 (239) | 5.5 (75) | 10.4 (164) | |
| **High job demands: %(n)** | 50.9 (1506) | 46.6 (635) | 54.5 (871) | <0.001 |
| **Low job control: %(n)** | 49.9 (1475) | 43.7 (596) | 55.2 (879) | <0.001 |
| **Low social support: %(n)** | 39.7 (1170) | 39.1 (533) | 40.3 (637) | 0.52 |
| **High efforts: %(n)** | 59.7 (1719) | 60.4 (807) | 59.0 (912) | 0.43 |
| **Low rewards: %(n)** | 47.9 (1383) | 49.5 (666) | 46.5 (717) | 0.110 |
| **High work-to-home conflict: %(n)** | 50.9 (1509) | 46.4 (635) | 54.8 (874) | <0.001 |
| **High home-to-work conflict: %(n)** | 50.0 (1483) | 45.3 (620) | 54.1 (863) | <0.001 |
| **Bullying: %(n)** | 26.6 (771) | 28.6 (383) | 24.9 (388) | 0.026 |

[a] results of t-test or chi square test

**Table 3.1.:** Description of socio-demographics, presenteeism and psychosocial factors

In table 3.2, some descriptive information is presented about the subgroup with good health and low neuroticism. These workers not only reported significantly less presenteeism, but also less exposure to psychosocial risk factors.

| Variables | Subgroup with good health and low neuroticism (n=1666) | Rest of the study population (n=1274) | *p*, difference between both groups[a] |
|---|---|---|---|
| **Mean age: years ( SD)** | 42.6 (6.7) | 44.2 (6.6) | <0.001 |
| **Gender:** | | | |
| Men | 51.7 (861) | 38.8 (494) | <0.001 |
| Women | 48.3 (805) | 61.2 (780) | |
| **Educational level: %(n)** | | | |
| Low | 18.4 (304) | 23.4 (296) | |
| Medium | 33.1 (549) | 37.3 (473) | <0.001 |
| High | 48.6 (807) | 39.3 (498) | |
| **Smoking: % (n)** | 23.5 (390) | 33.1 (418) | <0.001 |
| **Mean BMI: kg/m² (SD)** | 24.7 (3.7) | 25.6 (4.5) | <0.001 |
| **Seniority: %(n)** | | | |
| ≤5 years | 12.5 (207) | 9.2 (116) | 0.005 |
| >5 years | 87.5 (1454) | 90.8 (1151) | |
| **Presenteeism: % (n)** | | | |
| 0-1 times | 59.7 (983) | 36.0 (450) | <0.001 |
| >2 times | 40.3 (663) | 64.0 (799) | |
| **High job demands: %(n)** | 46.1 (763) | 57.5 (726) | <0.001 |
| **Low job control: %(n)** | 43.3 (717) | 58.4 (736) | <0.001 |
| **Low social support: %(n)** | 31.3 (517) | 51.1 (640) | <0.001 |
| **High efforts: %(n)** | 57.5 (928) | 62.9 (774) | 0.003 |
| **Low rewards: %(n)** | 37.3 (606) | 62.3 (764) | <0.001 |
| **High work-to-home conflict: %(n)** | 37.9 (629) | 68.4 (865) | <0.001 |
| **High home-to-work conflict: %(n)** | 42.2 (701) | 60.2 (761) | <0.001 |
| **Bullying: %(n)** | 18.5 (301) | 37.7 (465) | <0.001 |

[a] results of t-test or chi square test

**Table 3.2.:** Description of socio-demographics, presenteeism and psychosocial factors for the subgroup with good health and low neuroticism

The results of the univariate analysis showed a significant association between presenteeism and all considered psychosocial factors, except for job control (table 3.3). After adjustment for several confounders, the relation between HWC and presenteeism was no longer significant, while no important changes could be detected for the other psychosocial factors. Both high job demands (OR=1.64, 95% CI=1.39-1.93) and high efforts (OR=1.69, 95% CI=1.43-2.01) were associated with presenteeism. Furthermore, low support (OR=1.24, 95% CI=1.05-1.46) and low rewards (OR=1.53, 95% CI=1.30-1.81) were significantly related to presenteeism. A significant relation was observed between high levels of bullying (OR=1.32, 95% CI=1.09-1.61) and presenteeism. Finally, workers

reporting high levels of WHC (OR=1.84, 95% CI=1.54-2.20) also demonstrated more presenteeism. The third multiple model in which all psychosocial factors were entered simultaneously, revealed that high efforts, low rewards and high WHC were independently and significantly related to presenteeism. From the subgroup analysis on the selection of workers with good self-rated health and low neuroticism (table 3.4), highly similar results could be derived. In the multiple model, in which adjustments for the other psychosocial risk factors were made, only high WHC remained significantly associated with presenteeism.

| | **Crude model** | | **Adjusted model[a]** | | **Adjusted model[b]** | |
|---|---|---|---|---|---|---|
| | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** |
| Job demands | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.82*** ** | 1.57-2.11 | **1.64*** ** | 1.39-1.93 | 1.21 | 1.00-1.49 |
| Control | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | 0.88 | 0.76-1.02 | 1.14 | 0.96-1.35 | 1.10 | 0.91-1.32 |
| Social support at work | | | | | | |
| High | 1 | | 1 | | 1 | |
| Low | **1.59*** ** | 1.37-1.85 | **1.24*** | 1.05-1.46 | 0.98 | 0.81-1.20 |
| Efforts | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.63*** ** | 1.40-1.90 | **1.69*** ** | 1.43-2.01 | **1.34**** | 1.09-1.65 |
| Rewards | | | | | | |
| High | 1 | | 1 | | 1 | |
| Low | **1.96*** ** | 1.68-2.27 | **1.53*** ** | 1.30-1.81 | **1.42**** | 1.17-1.74 |
| Bullying | | | | | | |
| No | 1 | | 1 | | 1 | |
| Yes | **1.79*** ** | 1.51-2.12 | **1.32**** | 1.09-1.61 | 1.09 | 0.88-1.36 |
| Home-to- work conflict | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.44*** ** | 1.25-1.67 | 1.01 | 0.85-1.19 | 0.97 | 0.81-1.17 |
| Work-to- home conflict | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **2.46*** ** | 2.12-2.86 | **1.84*** ** | 1.54-2.20 | **1.61*** ** | 1.32-1.96 |

* $p<0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] Model is adjusted for gender, age, educational level, seniority, sector, smoking, body mass index, self-rated health, stress outside work, neuroticism

[b] Multiple model, including all psychosocial factors

**Table 3.3.:** Association between psychosocial factors and presenteeism, using logistic regression analysis (n=2983)

| | Crude model | | Adjusted model[a] | | Adjusted model[b] | |
|---|---|---|---|---|---|---|
| | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** |
| Job demands | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.45*** ** | 1.19-1.76 | **1.38** ** | 1.12-1.72 | 1.07 | 0.82-1.39 |
| Control | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | 0.99 | 0.81-1.21 | 1.12 | 0.90-1.39 | 1.14 | 0.89-1.46 |
| Social support at work | | | | | | |
| High | 1 | | 1 | | 1 | |
| Low | **1.43** ** | 1.16-1.76 | **1.30*** | 1.01-1.63 | 1.08 | 0.83-1.41 |
| Efforts | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.40** ** | 1.14-1.71 | **1.39*** | 1.11-1.74 | 1.18 | 0.90-1.55 |
| Rewards | | | | | | |
| High | 1 | | 1 | | 1 | |
| Low | **1.48*** ** | 1.20-1.82 | **1.36** ** | 1.09-1.69 | 1.15 | 0.89-1.50 |
| Bullying | | | | | | |
| No | 1 | | 1 | | 1 | |
| Yes | **1.70*** ** | 1.32-2.19 | **1.49** ** | 1.13-1.95 | 1.32 | 0.97-1.79 |
| Home-to- work conflict | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **1.46*** ** | 1.19-1.78 | 1.17 | 0.93-1.46 | 1.14 | 0.90-1.45 |
| Work-to- home conflict | | | | | | |
| Low | 1 | | 1 | | 1 | |
| High | **2.02*** ** | 1.65-2.48 | **1.85*** ** | 1.47-2.34 | **1.69*** ** | 1.31-2.18 |

* $p<0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] Model is adjusted for gender, age, educational level, seniority, sector, smoking, body mass index, stress outside work, neuroticism

[b] Multiple model, including all psychosocial factors

**Table 3.4.:** Association between psychosocial factors and presenteeism, using logistic regression analysis on the selection of workers with good or very good self-rated health and low neuroticism (n=1666)

## 3.4. Discussion

This study aimed to investigate the relation between several classical and some more emerging types of psychosocial risk factors, such as bullying and work-family conflict, and presenteeism. We observed that both work content and contextual psychosocial factors were significantly related to presenteeism.

Our study results demonstrated that high job demands and efforts were positively correlated to presenteeism, which suggests that employees will work while sick as a short-time strategy to avoid a decrement of productivity, which is actually in line with earlier research [5, 20, 38].
We were not able to demonstrate a significant relationship between job control and presenteeism in our study sample. Also in former studies, results with respect to this psychosocial factor were inconsistent and, as mentioned by Aronsson and Gustafsson [5], it is rather difficult to predict the specific relationship between control and presenteeism. On the one hand, high control is considered to be a risk for presenteeism, since workers in high control jobs may be able to adjust their work situation to their current physical and mental capabilities [24] . On the other hand, low control jobs are generally regarded as 'less healthy' jobs and therefore presenteeism may be a proxy for the health status of the worker. Nevertheless, we were not able to find a significant association between control and presenteeism, neither in the complete group, nor in the subgroup of healthy workers [44].
Low rewards were significantly related to presenteeism in workers. Rewards in the ERI-model relate to financial reward, esteem, career opportunities and job security. Especially job insecurity has been demonstrated to be significantly related to presenteeism in former research [23]. Alongside, also the financial situation is likely to affect the employee's decision whether to stay at home or to go at work when sick [3, 5]. Therefore, low rewards may stimulate the worker to choose for presenteeism in case of illness.
Low social support was significantly associated with presenteeism, which is generally confirming earlier research demonstrating social support as an important feature of the psychosocial work environment which influences the attendance behavior of the worker [25, 45]. However, former results are inconclusive whether lack of social support or high social support is associated with presenteeism [11, 25, 45]. Low support was proposed as a risk factor for presenteeism in the way that workers fear taking sickness absence [25]. Furthermore, high support in the workplace was suggested to 'promote' early return to work and thus presenteeism, which is in contrast with our results [25]. Finally, a recent study demonstrated that supervisor support is acting as a buffering mechanism in the relation between presenteeism and exhaustion [11].
To our knowledge, the specific relationship between bullying and presenteeism has not been extensively investigated earlier [32] [32]. In our study sample, bullying was significantly and positively related to presenteeism. A possible explanation for this finding may be the use of the bullying instrument which is specifically assessing the dimensions of isolation, destabilization and threat to personal standing, and does not refer to any dimension of harassment [39]. It is therefore possible, that someone who feels victim of this kind of bullying behavior, feels fear to choose for sickness absence and will likely prefer presenteeism to avoid further isolation and destabilization. Another possible explanation for this result can be found in the health status of the worker: victims of bullying may be in a worse health status which therefore leads to higher presenteeism [34].
While the impact of family responsibilities on work and sickness absence has been subject of investigation in earlier research [33, 46, 47], the relation with presenteeism was seldom examined [34]. Generally, it was demonstrated that HWC or the situation in which the family circumstances interfere

with the work role represents a risk factor for sickness absence [33]. In this perspective, it is assumed that high HWC would not or negatively be correlated to presenteeism [34], which is confirmed in both the total group and the subgroup, revealing no significant relation between high HWC and presenteeism. The relation between the other direction of the work family conflict, namely high WHC and presenteeism was also expected and established in an earlier study [34]. Someone experiencing duties at work to be interfering with the family responsibilities, will rather choose for presenteeism when sick.
The multiple model, in which all psychosocial factors were entered simultaneously, revealed that high efforts and low rewards were independently related to presenteeism, suggesting that the ERI-model of Siegrist may be particularly valuable in identifying psychosocial risk factors for presenteeism. Furthermore, also high WHC remained significant in the final multiple model, underlining the importance of this specific factor. Subgroup analysis roughly yielded similar results with respect to high WHC. Rewards were not significantly related to presenteeism anymore in this subgroup, which is possibly due to the fact that these workers with good self-rated health had significantly more high rewards in comparison with those with average or bad self-rated health.
Although gender differences were demonstrated in both psychosocial factors and presenteeism, no significant interaction effects between psychosocial factors and gender in relation with presenteeism could be revealed. Therefore the analyses were not conducted separately for men and women. Moreover, additional analyses, stratified for gender (results not shown), yielded highly similar results.

Although this study extends the existing literature on presenteeism, several limitations have to be mentioned. The main limitation consists of the cross-sectional design using self-reported measures, which restricts the conclusion and does not allow to provide causal explanations. Nevertheless, several precautionary measures were taken to reduce common method bias in our results: confidentiality was guaranteed to lower social desirable answers, the relations were adjusted for a measure of negative affectivity and additional subgroup analyses were conducted on a limited sample with low neuroticism and good self-rated health. Moreover, in contrast with sickness absence measures, it is quite challenging to obtain objectively registered presenteeism figures and almost all studies investigating presenteeism are based on self-reports [2].The use of a single item questionnaire for the assessment of presenteeism, which could be affected by recall bias, is a limitation that should be mentioned. However, this single question is applied by several former investigators, suggesting similar presenteeism frequencies [4, 8, 15, 23, 38]. Furthermore, sensitivity analyses, with alternative cut-off points for defining presenteeism (> 1 time going at work despite illness; >5 times going at work despite illness) lead to roughly similar results, consequently underlining our conclusions. A second limitation is the relatively low response rate, which possibly leads to a selection bias in the population. Unfortunately, we were not able to examine whether non-respondents differed from respondents regarding psychosocial factors or presenteeism. Although no important differences in age and gender were discovered, caution should be made in generalization of the results. Additionally, it should be noted that the Belstress III study does not consist of a representative sample of the Belgian working population. Nevertheless, this is less important in analytical studies like this one, where possible relationships are examined [48]. Although adjustments were made for several confounding factors, including neuroticism as a personality trait, it is quite imaginable that some important confounders were not measured and supplementary adjustments may have resulted in different findings. For instance, no information was available on the application of specific sickness management strategies in the companies nor about the attitudes of the workers towards their health and sickness absence. These are issues which may confound the results and are not fully captured by the confounding variables, that we had information on. Finally, the use of dichotomous exposure variables, which may cause a loss of information due to categorization, can be subject of debate. However, this decision was made since some psychosocial variables were highly skewed and in order to make the odds ratios

easier to interpret. Moreover, additional analysis performed with continuous psychosocial variables, resulted in similar conclusions.

The major strength of our study is that, besides adjustment for self-rated health and several lifestyle variables, we also adjusted the models for neuroticism, which is a personality trait referring to a tendency to experience a negative affect [43]. This personality trait is expected to be involved in the reaction on job stressors [49]. Furthermore, neuroticism might predispose workers to fear about the negative consequences of taking sick leave (such as financial loss, job insecurity, and worries about the personal image) and therefore force them into presenteeism[12, 25]. In a preliminary analysis, neuroticism was confirmed to be significantly and positively correlated to presenteeism, which additionally emphasizes the importance of treating this personality factor as a major confounder. Also the additional subgroup analysis on a selection of workers with good self-rated health and low neuroticism underlines the strength of our results, since no important changes could be revealed between the results of the subgroup analysis and the analysis on the whole group.

## 3.5. Conclusions

In conclusion, our study demonstrates that both job content related factors as well as work contextual psychosocial factors were significantly related to presenteeism. This independent relationship between psychosocial factors and presenteeism was not only demonstrated on the total group of workers, but also on a selection of workers with good self-rated health and low neuroticism, which therefore underlines the importance of these factors in the attendance behavior. Hence, our results highlight the multidimensional nature of this phenomenon by demonstrating the importance of the work environment in the attendance behavior of the individual worker.
Some recommendations can be made for further research. In order to reveal the relationship between psychosocial factors and the attendance behavior of the employee, both presenteeism and sickness absence figures should be considered together in a longitudinal study. This should enable getting more insight into the effect of specific psychosocial factors on the decision making of ill workers to stay at home or to go working. In addition, it is also recommended to study the association of physical demands and ergonomic preventive measures on the attendance behavior.
The main implication for practice is that presenteeism, which is a behavior of the worker with possible negative consequences for both the individual worker and the employer, is not purely driven by the health status of the worker, but several psychosocial factors play also an important role.
This specific knowledge may be of great importance to direct policies and management strategies aiming to reduce costs related to sickness absence and presenteeism.

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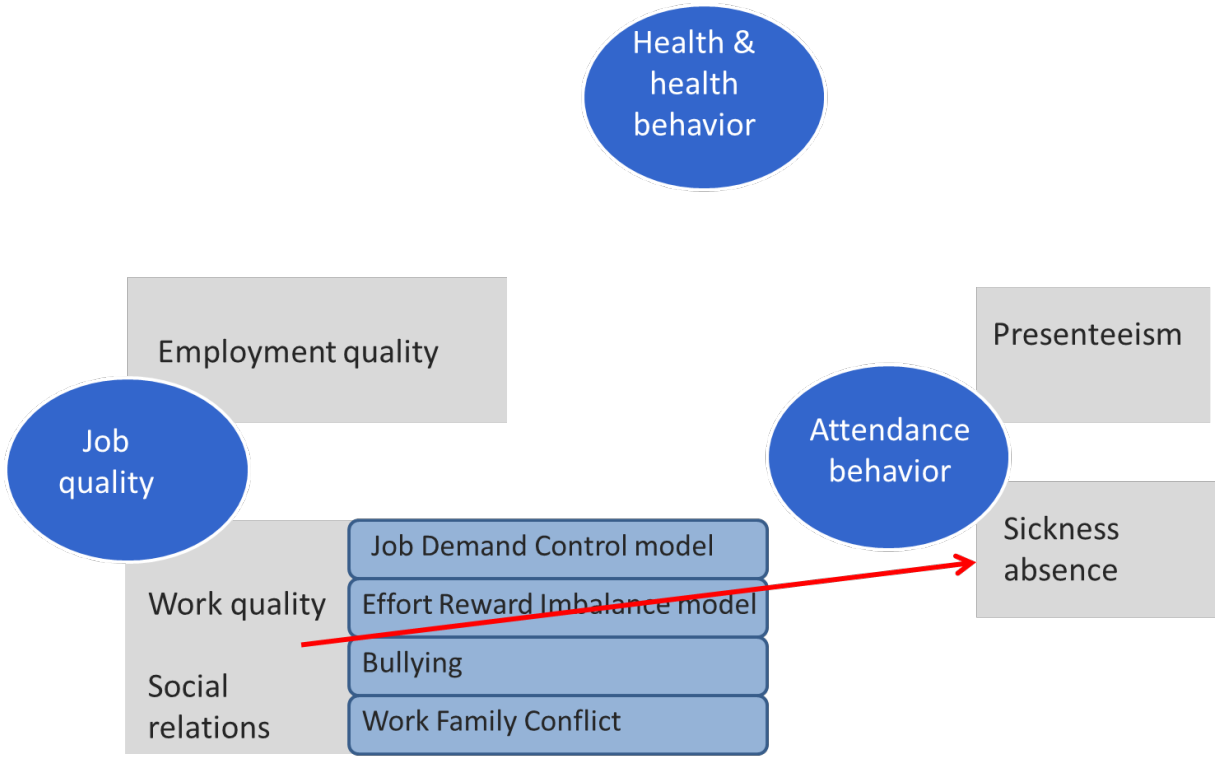
# Chapter 4.

# Relation between work quality and cause-specific absenteeism




Based on :

Janssens H, Clays E, De Clercq B, Casini A, De Bacquer D, Kittel F, Braeckman L. The relation between psychosocial risk factors and cause-specific long-term sickness absence. European Journal of Public Health 2014, 24(3): 428-433.

# ABSTRACT

**Background:**
The aim was to study the impact of psychosocial risk factors on long-term sickness absence due to mental health problems (LSA-MH) or musculoskeletal disorders (LSA-MSD) in 2983 Belgian middle aged workers.

**Methods:**
Data were collected from 1372 male and 1611 female workers in the Belstress III study. Considered psychosocial risk factors were job demands, job control, social support, job strain, efforts, rewards, efforts-rewards imbalance and bullying. Prospective, registered sickness absence data were collected during 12 months follow-up; the causes for long-term sickness absence episodes of at least 15 consecutive days were obtained by contacting the general practitioner of the worker. Multiple logistic regression models were used to investigate the relationship between the psychosocial risk factors and LSA-MH and LSA-MSD.

**Results:**
Higher levels of rewards at baseline were independently and significantly associated with a lower risk for LSA-MH. Higher levels of control were associated with a lower risk for LSA-MSD during follow-up. Higher job demands and efforts were significantly related to a lower risk for LSA-MSD. Finally, bullying was significantly and independently related to both LSA-MH and LSA-MSD during the follow-up period.

**Conclusions:**
These results suggest that psychosocial risk factors are related to LSA-MH and LSA-MSD, of which especially bullying seems to be a potent stressor.

## 4.1. Introduction

Sickness absence is a multifactorial phenomenon determined by personal, socio-demographical, lifestyle- and health-related factors, but also physical and psychosocial work-related risk factors play a role. The majority of studies addressing the contribution of psychosocial work risks on all-cause sickness absence are based on the Job-Demand-Control (JDC) model, assuming that high job demands will result in psychological strain and health problems, when the level of job control is low [1]. Allebeck et al. [2] concluded that high job control was clearly associated with lower sickness absence, while high job demands are related to higher sickness absence in most of the studies [3, 4]. The Effort-Reward-Imbalance (ERI) model- assuming that an imbalance between efforts and rewards will evoke a sustained stress reaction - has also been applied in this research area [5]. This stress reaction increases the risk of adverse health effects, leading to higher sickness absence, which has been confirmed in several studies [6, 7]. Later, the JDC model was extended with the social support dimension, the Job-Demand-Control-Support (JDCS) model, indicating the importance of dimensions referring to work relations in explaining health and sickness absence [1]. Several studies have demonstrated that low social support is associated with higher sickness absence [8, 9]. However, not only the absence of positive relationships (social support), but also the presence of negative relationships possibly affect sickness absence. An extreme situation of negative relations is bullying, referring to the situation in which a worker is exposed to 'repeated and enduring negative acts' [10]. Until now, the relation between bullying and sickness absence has been reported by only a few authors [11, 12].

Mental health and musculoskeletal disorders are two of the major causes of long-term sickness absences in Western countries and account for a huge loss of productivity [13, 14]. It is well established that psychosocial work factors are of major importance in the development of mental health [15, 16] and musculoskeletal problems [17, 18]. Notwithstanding, the impact of these psychosocial risk factors on cause-specific sickness absence has not been investigated extensively. Studies examining the determinants of absenteeism due to musculoskeletal problems, mainly focus on the physical working environment [19]. Only a few studies demonstrate that also psychosocial risk factors impact absenteeism due to musculoskeletal problems, but overall results are not conclusive [19-21]. Studies investigating the relation between psychosocial work characteristics and sickness absence due to mental health problems are rather scarce. Essentially, results have suggested that lack of work social support is related with psychiatric related sickness absence [20, 22, 23], while the results for low job control and high job demands were inconsistent [20, 22, 24]. Summarizing, only few studies have investigated the effect of psychosocial risk factors on both types of cause-specific sickness absence resulting in mixed findings. These studies only consider the JDCS model, an approach which probably misses particular aspects of the psychosocial work environment, since this model ignores bullying and some features of the current working context, which are incorporated in the ERI model. Additionally, some of these studies are based on self-reported sickness absence, which is obviously less reliable than registered absenteeism measures [25, 26].

Therefore, this longitudinal study aims to extensively examine the impact of psychosocial work factors, based on both the JDCS- and the ERI model, and bullying on long-term sickness absence due to mental health problems (LSA-MH) and on long-term sickness absence due to musculoskeletal disorders (LSA-MSD) in a group of Belgian workers.

## 4.2. Methods

### 4.2.1. Study population

The prospective Belstress III study was conducted in seven companies or public administrations across Belgium in 2004. All workers aged 30 to 55 years received a personal letter inviting them to volunteer. A total of 2983 workers joined in the study, resulting in a response rate of 30.4%. Analysis of the non-respondents, revealed no important differences regarding age and gender [27].

### 4.2.2. Data collection

At baseline, all participants completed a questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and characteristics of the psychosocial work environment.

**a) Independent variables**

Work-related psychosocial risk factors were assessed, based on the JDCS-[1] and the ERI-model [5], using 4-point Likert items. Sum scores were created for job demands (five items), job control (9 items) and social support (8 items). Job strain was defined as the ratio of job demands over job control.
Effort was assessed by the sum score of five items, measuring demanding aspects of the work environment. Reward was measured by the sum score of eleven items, containing financial reward, esteem, career opportunities and job security. To define the effort-reward imbalance, the effort-reward ratio, which is the sum score of effort divided by the sum score of reward, was calculated. Bullying was questioned using nine items mainly referring to isolation and destabilization, based on the scale of Quine [28]. Response categories on every question were: “yes, absolutely”, “rather yes”, “rather no”, “absolutely not”. The sum score for the nine items was calculated.
Cronbach’s alpha’s for the scales were acceptable (> 0.75), except for job demands. All scales were entered in the models as continuous variables.

**b) Confounding factors**

Several individual and socio-demographic variables were questioned, including age, gender and educational level. Low educational level was defined as completing the primary school and the first 3 years of secondary school, medium education was defined as completing secondary school and high education as completing high school or university.
Respondents were questioned about several health indicators and behaviors, such as current smoking habits (yes/no), alcohol use (average number of units per week day and weekend day), weight and height, and physical activity outside work. For alcohol use, the average number of units per week was computed. Body Mass Index (BMI) was calculated as the self-reported weight divided by the squared height (kg/m²). Physically active persons were considered to sport or to do strenuous physical activities during minimal 20 minutes, at least two times a week.
Five items from the Job Content Questionnaire were included to assess the level of physical demands and the sum score for this scale was calculated [1].
To evaluate the amount of stress outside work, an eight-items based scale regarding problems in private life was used [29]. For the measurement of symptoms of depression, the sum score of the eleven-items scale of the Center for Epidemiological Studies-Depression scale was applied [30]. To assess the presence of low back problems, the workers were also questioned about the total number of days, they

perceived low back pain during the last year. Response categories were 0 days, 1-7 days, 8-30 days, more than 30 days and every day.

**c) Sickness Absence data**

The sickness absence data were collected prospectively during 12 months follow-up, starting from the day on which the questionnaire was filled out. The data were obtained from the personnel administration departments of the participating companies. In Belgium a medical certification for absences of more than one day is required, to benefit from guaranteed salary and medical insurance. Subsequently, the sickness absence registration is expected to be highly accurate. Complete sickness absence data could be gathered for 2876 participants; 107 were lost during follow-up. This drop-out was mainly due to resignation or dismissal, and not attributable to health-related reasons. In case of long-term sickness absence of at least 15 consecutive days, the cause was retrieved by contacting the general practitioner of the worker. A total of 522 long-term sickness absence episodes were registered, of which the reason could be acquired in 290 cases.
Among these cases, 85 were classified as LSA-MH and 95 were categorized as LSA-MSD.
The majority of the LSA-MH cases concerned depression. The LSA-MSD mainly included low back disorders, repetitive strain injuries of the upper limbs and neck disorders.

### 4.2.3. Statistical analysis

Chi² tests or Mann-Whitney U tests were conducted to assess the differences in socio-demographics, health behaviors and psychosocial work characteristics between the subsample with/without LSA-MH and LSA-MSD.
The relation between the psychosocial risk factors and respectively LSA-MH and LSA-MSD was examined, using multiple logistic regression analysis. In model 1, crude odds ratios were calculated and are presented per one standard deviation increase in the exposure variable. Next, interaction terms between gender and the psychosocial risk factors were tested. None of them were significant at the level of $p < 0.10$. We thus did not stratify for gender. In a further step, the odds ratios were adjusted for several confounders, considered as probable risk factor for sickness absence [2]. The following covariates were considered: gender, age, educational level, smoking habits, alcohol use, BMI, physical demands at work and stress outside work. Moreover, in the model assessing the odds ratios for LSA-MH, the depressive symptoms scale was also entered as a confounder, while in the model calculating the odds ratios for LSA-MSD, the number of days perceiving low back pain was used as confounder. The fully adjusted models were reduced by eliminating the nonsignificant (p-value > 0.10) confounders, while forcing the psychosocial risk factor in the model. This backward procedure was conducted to avoid overadjustment given the relatively low number of outcome events (model 2).
Models were screened for multicollinearity according to the calculation of Variance Inflation Factors, which revealed no problems. All models were evaluated at 95% significance level ($p < 0.05$). The analyses were conducted using PASW 19.0 software.

## 4.3. Results

### 4.3.1. Descriptive analyses

The study population consisted of 1372 men (46%) and 1611 women (54%) who were employed within three (semi-)public administrations (53% of the sample), three companies from the service sector (39%) and one manufacturing company (8% ). The majority of the participants (72%) worked full-time.
Four workers were excluded from the analysis, since they had both types of cause-specific sickness absence. This resulted in a sample with LSA-MH consisting of 81 workers, while the group with LSA-MSD comprised 91 workers. Description of the psychosocial risk factors and confounding variables for both the total sample and the subsamples with/without LSA-MH and LSA-MSD is displayed in table 4.1.

Tables 4.2 and 4.3 report the results from logistic regression analysis for psychosocial risk factors in relation with respectively LSA-MH and LSA-MSD.

### 4.3.2. Psychosocial risk factors for LSA-MH (table 4.2)

After adjustment, the results demonstrate that workers reporting higher level of rewards had a lower risk for LSA-MH during follow-up (OR/SD increase = 0.76; 95%CI= 0.60-0.97). Also, reporting higher levels of bullying was significantly associated with a higher risk for LSA-MH (OR/SD increase=1.32; 95%CI= 1.06-1.64). No significant association between the other psychosocial risk factors and LSA-MH could be detected.

### 4.3.3. Psychosocial risk factors for LSA-MSD (table 4.3)

After adjustment, the model reveals that higher levels of control were associated with a lower risk for LSA-MSD (OR/SD increase= 0.73; 95%CI= 0.58-0.98). Similarly to LSA-MH, reporting higher levels of bullying was associated with a higher risk for LSA-MSD (OR/SD increase= 1.29; 95%CI= 1.06-1.58). Finally, reporting higher job demands and efforts were associated with a lower risk for LSA-MSD (OR/SD increase job demands= 0.77; 95%CI= 0.60-0.98; OR/SD increase efforts= 0.76; 95%CI= 0.60-0.95).

| Variables | Total sample (n=2983) | Subsample with LSA-MH (n=81) | Subsample without LSA-MH (n=2559) | $P^a$ | Subsample with LSA-MSD (n=91) | Subsmple without LSA-MSD (n=2549) | $p^a$ |
|---|---|---|---|---|---|---|---|
| **Mean age: years ( SD)** | 43.3 (6.74) | 45.4 (6.38) | 43.2 (6.74) | <0.01 | 44.0 (6.36) | 43.2 (6.75) | 0.34 |
| **Women: %(n)** | 54 (1611) | 65.4 (53) | 53.2 (1361) | <0.05 | 61.5 (56) | 53.3 (1358) | 0.12 |
| **Mean BMI: kg/m² (SD)** | 25.1 ( 4.08) | 25.2 (3.82) | 25.1 (4.03) | 0.39 | 26.7 (3.89) | 25.0 (4.01) | <0.001 |
| **Educational level:% (n)** | | | | | | | |
| **Low** | 20.8 (617) | 22.2 (18) | 20.2 (515) | | 30.8 (28) | 19.9 (505) | |
| **Medium** | 34.7 (1031) | 42.0 (34) | 34.0 (871) | 0.19 | 45.1 (41) | 33.9 (860) | <0.001 |
| **High** | 44.5 (1323) | 35.8 ( 29) | 45.8 (1167) | | 24.2 (22) | 46.2 (1174) | |
| **Smoking: % (n)** | 27.6 ( 816) | 34.6 (28) | 26.6 (675) | 0.11 | 38.5 (35) | 26.4 (668) | <0.05 |
| **Alcohol use/week: mean number of units (SD)** | 12.0 (13.04) | 15.4 (17.69) | 11.8 (12.71) | 0.33 | 14.4 (18.90) | 11.8 (12.62) | 0.93 |
| **Depressive symptoms: mean score (SD) (Range:11-33)** | 16.1 (4.42) | 19.7 (4.96) | 15.8 (4.21) | <0.001 | 16.7 (4.46) | 15.9 (4.28) | 0.06 |
| **Physical active outside work: % (n)** | 31.5 (941) | 21.0 (17) | 33.0 (833) | <0.05 | 19.8 (18) | 33.1 (832) | <0.01 |
| **Physical work demands: mean (SD) (range: 5-20)** | 10.6 (3.78) | 11.2 (4.14) | 10.5 (3.75) | 0.13 | 12.3 (3.95) | 10.4 (3.74) | <0.001 |
| **Low back pain: mean score (SD) (range: 1- 5)** | 2.5 (1.31) | 2.6 (1.54) | 2.4 (1.29) | 0.39 | 3.2 (1.38) | 2.4 (1.28) | <0.001 |
| **Problems outside work: mean score (SD) (range:9-33)** | 12.9 (3.52) | 15.0 (4.76) | 12.7 (3.35) | <0.001 | 13.3 (3.65) | 12.7 (3.41) | 0.13 |
| **Job demands: mean score (SD) (range:12-48)** | 30,4 (5.85) | 31.3 (6.42) | 30.3 (5.72) | 0.38 | 29.9 (6.78) | 30.3 (5.71) | 0.29 |
| **Job control: mean score (SD) (range: 24-96)** | 68.2 10.30) | 64.9 (10.96) | 68.6 (10.12) | <0.01 | 64.0 (11.93) | 68.7 (10.06) | <0.001 |
| **Job strain: mean score (SD) (range: 0.13-1.58)** | 0.46 (0.120) | 0.49 (0.127) | 0.45 (0.115) | <0.01 | 0.49 (0.159) | 0.45 (0.114) | <0.05 |
| **Social support: mean score (SD) (range: 8- 32)** | 22.8 (3.68) | 21.3 (4.14) | 23.0 (3.58) | <0.001 | 22.3 (4.16) | 23.0 (3.58) | 0.20 |
| **Efforts: mean score (SD) (range: 5- 20)** | 14.2 (2.84) | 14.5 (2.74) | 14.3 (2.81) | 0.50 | 13.8 (3.01) | 14.3 (2.80) | 0.12 |
| **Rewards: mean score (SD) (range: 11- 44)** | 29.4 (4.98) | 27.2 (5.50) | 29.7 (4.87) | <0.001 | 28.0 (5.37) | 29.7 (4.88) | <0.01 |
| **Effort Reward Imbalance: mean score (SD) (range:0.28-3.67)** | 1.1 (0.34) | 1.2 (0.45) | 1.1 (0.32) | <0.01 | 1.2 (0.39) | 1.1 (0.33) | 0.48 |
| **Bullying: mean score (SD) (range: 9-36)** | 13.7 (4.85) | 16.2 (5.75) | 13.4 (4.65) | <0.001 | 15.6 (5.63) | 13.4 (4.65) | <0.001 |

[a] results of p-value of Mann-Whitney U test or chi square test to assess the difference between samples with and without the respective cause-specific long-term sickness absence.

**Table 4.1.:** Descriptive variables for the total sample and the subsamples with and without LSA-MH / LSA-MSD

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | p-value | OR | 95% CI | p-value |
| Job demands [a,e,j] | 1.18 | 0.95-1.47 | 0.126 | 0.90 | 0.71-1.15 | 0.429 |
| Job control [a, e,j] | **0.70** | 0.58-0.86 | 0.001 | 0.81 | 0.65-1.02 | 0.078 |
| Support at work [a,e,j] | **0.63** | 0.51-0.78 | <0.001 | 0.83 | 0.65-1.05 | 0.120 |
| Job strain [a,e,j] | **1.34** | 1.13-1.60 | 0.005 | 1.06 | 0.85-1.33 | 0.600 |
| Efforts [a,e,j] | 1.10 | 0.88-1.39 | 0.387 | 0.91 | 0.71-1.17 | 0.465 |
| Rewards [a,e,j] | **0.61** | 0.49-0.76 | <0.001 | **0.76** | 0.60-0.97 | 0.027 |
| Effort Reward Imbalance [a,e,j] | **1.43** | 1.18-1.72 | <0.001 | 1.11 | 0.88-1.39 | 0.363 |
| Bullying [a,e,j] | **1.61** | 1.33-1.94 | <0.001 | **1.32** | 1.06-1.64 | 0.012 |

Notes. Significant associations at the 0.05 level are in bold

Model1-crude model

Model 2-Results of the backward analysis: covariates retained in the final model are listed next to the risk factor. Following covariates were initially entered in the analysis: age ([a]), gender([b]), educational level ([c]), body mass index ([d]),alcohol consumption ([e]), physical activity ([f]), stress outside work ([g]), physical demands at work ([h]), smoking ([i]), baseline depressive symptoms ([j]).

**Table 4.2.:**. Results from the multivariate logistic regression analysis for psychosocial risk factors at work and long-term sickness absence (> 15 consecutive days) due to mental health problems.

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | p-value | OR | 95% CI | p-value |
| Job demands [d,f,h,i,j] | 0.93 | 0.74-1.15 | 0.501 | **0.77** | 0.60-0.98 | 0.030 |
| Job control [d,e,f,h,i,j] | **0.65** | 0.53-0.79 | <0.001 | **0.73** | 0.58-0.91 | 0.003 |
| Support at work [c,d,f,h,i,j] | 0.83 | 0.68-1.03 | 0.093 | 0.91 | 0.73-1.13 | 0.417 |
| Job strain [c,d,f, h,i,j] | **1.31** | 1.10-1.55 | 0.002 | 1.09 | 0.90-1.32 | 0.382 |
| Efforts [d,f,h,i,j] | 0.84 | 0.68-1.04 | 0.112 | **0.76** | 0.60-0.95 | 0.016 |
| Rewards [c,d,f,h,i,j] | **0.74** | 0.58-0.91 | 0.002 | 0.80 | 0.64-1.02 | 0.067 |
| Effort Reward Imbalance [c,d, f, h, i, j] | 1.16 | 0.95-1.42 | 0.145 | 1.06 | 0.84-1.34 | 0.604 |
| Bullying [c,d,f,h,i,j] | **1.47** | 1.23-1.76 | <0.001 | **1.29** | 1.06-1.58 | 0.011 |

Notes. Significant associations at the 0.05 level are in bold
Model1-crude model
Model 2-Results of the backward analysis: covariates retained in the final model are listed next to the risk factor. Following covariates were initially entered in the analysis: age ([a]), gender([b]), educational level ([c]), body mass index ([d]),alcohol consumption ([e]), physical activity ([f]), stress outside work ([g]), physical demands at work ([h]), smoking ([i]), baseline back complaints ([j]).

**Table 4.3.:** Results from the multivariate logistic regression analysis for psychosocial risk factors at work and long-term sickness absence (> 15 consecutive days) due to musculoskeletal problems.

## 4.4. Discussion

The present study examines the impact of psychosocial working characteristics on both LSA-MH and LSA-MSD in a cohort of 2876 Belgian workers. The findings of this prospective study add new insights to the existing literature, since - some dimensions of the ERI-model and especially bullying were also revealed as risk factors for cause-specific sickness absence.
A significant effect on LSA-MH was demonstrated for both rewards and bulling, which are two aspects of the psychosocial work environment not earlier investigated regarding this specific outcome. This finding suggests that higher rewards could lower sickness absence due to mental health problems, while neither efforts nor the ERI-score predicted LSA-MH. Bullying seems to be an important independent risk factor for LSA-MH. Although the relation between bullying and sickness absence due to mental health problems was not formerly investigated, the result is consistent with expectations. Sickness absence as reaction on the exposure to bullying can be considered as a coping behavior (escaping from the detrimental working environment), but also as an attempt to recover from the mental health impact. In contrast with the existing literature, we found no effect of job demands, job control or social support on LSA-MH [20, 22-24]. It should however be noted that these studies are not comparable with respect to the study population, the length of follow-up period and the applied definition of mental health related sickness absence.

As suggested by several authors, low job control was retained as a significant psychosocial risk factor for LSA-MSD [31, 32]. Several explanations are made to understand how control may impact musculoskeletal disorders. A first possibility is that for employees "control" also comprises control over the physical demands. Second, a decreased control may also affect perceived stress, which successively modify muscle tension. Finally, control possibly influences sympathetic or adrenocortical activity, causing peripheral changes in muscles and pain perception. Low support was not a risk for LSA-MSD in our study population, which is in line with the findings of Ijzelenberg [25], but contrasted the conclusion of several other authors [33-35]. These conflicting results may be explained by the use of different questionnaires assessing social support or different measures for the outcome. Surprisingly, both job demands and efforts seemed to lower the risk for LSA-MSD. This finding is in contrast with former results, demonstrating that job demands are a risk for musculoskeletal disorders. However, similar protective effects of work pace on sickness absence due to back pain were observed in the Whitehall study [31]. This finding was attributed to the fact that high pace among these British civil servants would be an indicator of doing varied work. Accordingly, high work pace implies task variation, which probably is more related to high control. Additional analysis, forcing both job demands/ efforts and control in a model, revealed that this significant relation disappeared, which supported this hypothesis. Finally, bullying was also an important predictor of LSA-MSD. To our knowledge, no previous research has investigated the effect of this specific psychosocial risk factor on sickness absence due to musculoskeletal disorders. Although earlier research has established the association of workplace bullying and several health problems [10, 36] - the relation between bullying and musculoskeletal complaints was only investigated by a few authors, revealing this stressor as a risk factor for musculoskeletal complaints [35].

Our data thus demonstrated that bullying is a very potent psychosocial stressor, being a predictor for several types of cause-specific sickness absence. One can hypothesize that sickness absenteeism is a coping mechanism, rather than a reflection of a real health problem [37]. However, since our sickness absence data were based on objectively registered figures and reasons of sickness absence $\geq$ 15 days were retrieved by the general physician of the worker, we can suggest that bullying seems to be a real threat to the victim's health. Moreover, previous studies demonstrated that bullying is associated with both psychological and psychosomatic health problems[10, 36, 38]. However, the precise mechanism through which bullying exerts its ill-making effect is less examined. Theoretically, the bullying-health relation can be explained by both a direct and an indirect pathway. A few studies demonstrated that an alteration in the activity of the hypothalamo-pituitary-adrenal axis may play a direct role in the origin of several health problems in victims of bullying[39, 40]. Additionally, bullying may also indirectly lead to illnesses, since previous studies have demonstrated a relation between the perception of job stressors and a variety of unhealthy behaviors[41-43].

To the authors' knowledge, this is the first study assessing several aspects of the psychosocial work environment in relation with cause-specific sickness absence. However, there are some limitations that have to be mentioned.

First, the fairly low response rate can lead to a selection bias in the population. Although no important differences in age and gender were revealed, we were unfortunately not able to examine whether non-respondents differed from respondents with respect to sickness absence levels. However, this type of bias could have resulted in an underestimation of the relations. Second, the participants of the Belstress III study were not recruited from a representative sample of the Belgian working population. Therefore, caution should be made in generalization of the results. Nevertheless, representativeness is less crucial in analytical studies like this one, where possible causal relationships are examined [44]. Another selection bias could have been caused by the dropout of 107 workers during follow-up and workers of whom the cause of long-term sickness absence could not be retrieved. Additional analysis

revealed no significant difference in psychosocial risk factors and baseline self-reported sickness absence between the included group and the workers lost during follow-up or without information about the cause of long-term sickness absence. Also the applied backward procedure can be discussed. However, we decided to follow this technique to retain a limited number of confounding factors. This was necessary since only a restricted number of outcome events were available in our study group, which made the need to create a model with few confounding variables even more crucial. Nonetheless, additional analysis forcing all the confounding covariates into the model, resulted in roughly similar conclusions. The limited number of outcome events hampered stratification for gender. Although previous research demonstrated gender differences in all-cause sickness absence, which was partly attributed to job stress (27), preliminary analysis revealed no significant interaction effects. This allowed conducting the analysis on the entire group. Finally, the use of continuous exposure variables, which made the odds ratios less easy interpretable, can be subject of debate. However, this prevented a loss of information by dichotomizing the scales and maintained a consistent approach for all risk factors. Moreover, additional analysis performed with dichotomous variables, resulted in similar conclusions.

A major strength of our study is the prospective follow-up of the sickness absence data. Secondly, the data enabled investigating the relation with multiple psychosocial risk factors, which exceeded the application of the leading JDCS-model by including dimensions of the ERI-model and bullying. Third, the results were based on registered, objective absenteeism measurements. Finally, this study allowed adjusting for several potential confounders, particularly baseline depressive symptoms and back complaints.

In conclusion, our study demonstrates that low rewards were a risk factor for LSA-MH. Psychosocial risk factors important for LSA-MSD were low demands, low efforts and low job control. Bullying was a potent risk factor, contributing to both LSA-MH and LSA-MSD. Some recommendations can be made for research: studies investigating the effect of psychosocial risk factors on health and absenteeism have to consider bullying as a potential stressor. The main implication for management, planning strategies to reduce musculoskeletal and mental health related absenteeism, is that increasing job control and rewards, and especially preventing of bullying, have the potential to reduce the burden of both types of sickness absence.

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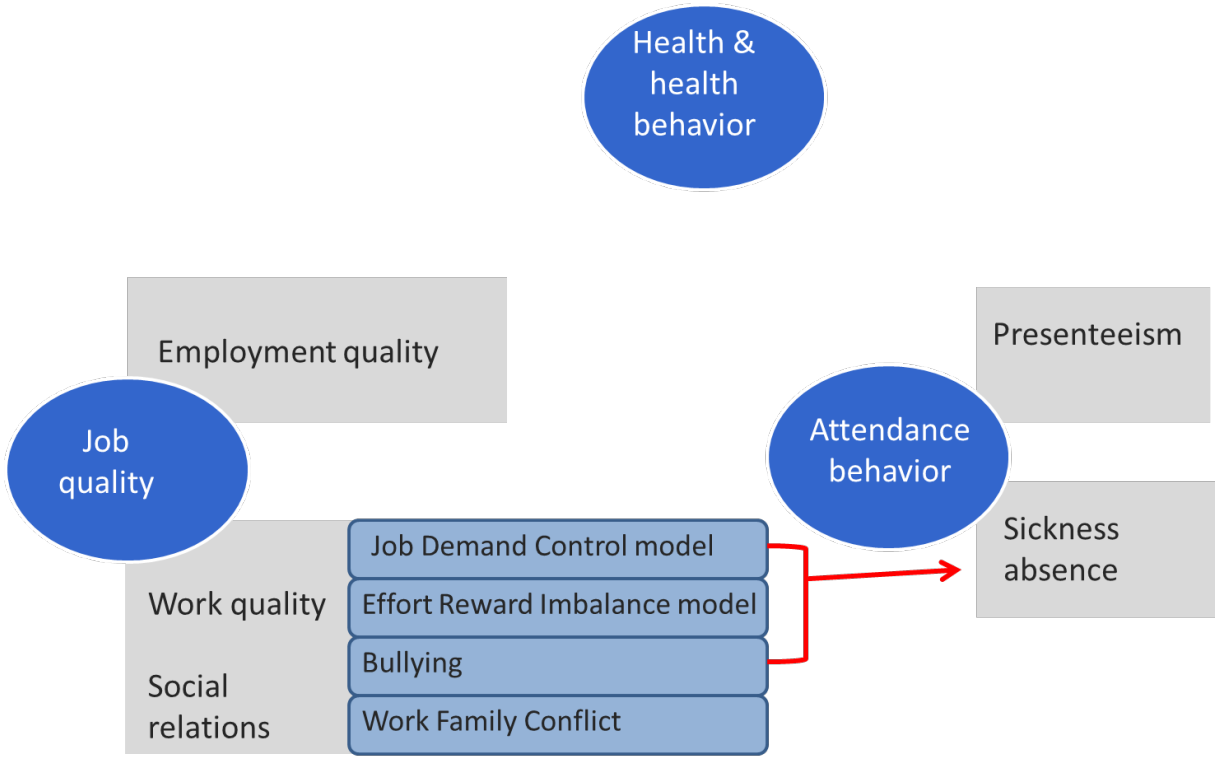
# Chapter 5.
# Interplay between work quality aspects in relation with sickness absence




Based on :

Janssens H., Braeckman L., De Clercq B., Casini A., De Bacquer D., Kittel F., Clays E., The indirect association of job strain with long-term sickness absence through bullying: a mediation analysis using structural equation modeling. BMC Public Health. *In revision*

# ABSTRACT

**Background:**
In this longitudinal study the complex interplay between both job strain and bullying in relation to sickness absence was investigated. Following the "work environment hypothesis", which establishes several work characteristics as antecedents of bullying, we assumed that job strain, conceptualized by the Job-Demand-Control model, has an indirect relation with long-term sickness absence through bullying.

**Methods:**
The sample consisted of 2983 Belgian workers, aged 30 to 55 years, who participated in the Belstress III study. They completed a survey, including the Job Content Questionnaire and a bullying inventory, at baseline. Their sickness absence figures were registered during one year follow-up. Long-term sickness absence was defined as at least 15 consecutive days. A mediation analysis, using structural equation modeling, was performed to examine the indirect association of job strain through bullying with long-term sickness absence. The full structural model was adjusted for several possible confounders: age, gender, occupational group, educational level, company, smoking habits, alcohol use, body mass index, self-rated health, baseline long-term sickness absence and neuroticism.

**Results:**
The results support the hypothesis: a significant indirect association of job strain with long-term sickness absence through bullying was observed, suggesting that bullying is an intermediate variable between job strain and long-term sickness absence. No evidence for the reversed pathway of an indirect association of bullying through job strain was found.

**Conclusions:**
Bullying was observed as a mediating variable in the relation between job strain and sickness absence. The results suggest that exposure to job strain may create circumstances in which a worker risks to become a target of bullying. Our findings are generally in line with the work environment hypothesis, which emphasizes the importance of organizational work factors in the origin of bullying.
This study highlights that remodeling jobs to reduce job strain may be important in the prevention of bullying and subsequent sickness absence.

## 5.1. Background

Management of sickness absence remains one of the major concerns of most employers and governments, in order to reduce the related costs for companies and society. In Belgium, the levels of sickness absence and associated costs have increased during last decade. This finding is mainly attributed to long spells of sick leave [1]. In 2010, the total burden of sickness absence, for an employer with 200 workers, was estimated at €1.053.360, which includes both direct (secured wages) and indirect costs (reorganizational problems, replacement costs, quality loss, reduced productivity) [1].

Therefore, employers put emphasis on repressive measures which focus on sickness absence control. But also more preventive strategies toward sickness absence, which concentrate on redesign of jobs to improve several jobs characteristics, have gained growing attention.

### 5.1.1. Job Strain and Sickness Absence

Several work-related psychosocial stressors are considered risk factors for sickness absence.
The Job-Demand-Control (JDC)-model of Karasek [2] is one of the most leading job stress models since 1980's and assumes that the combination of high demands and low control ( job strain) will result in stress reactions, such as high blood pressure [3, 4] and decreased psychological well-being [5]. Besides these health and well-being outcomes, several authors also demonstrated a relation between job strain and future sickness absence [6, 7].
Although numerous studies have demonstrated the association between several work stressors and health variables, the processes leading to these health problems are less investigated and this research mainly focuses on the individual physiological changes. However, exposure to psychosocial work stressors not only causes physiological changes at the individual level, but can also have effects on the social relations between colleagues. One of the more extreme forms of dysfunctional social interaction between workers is interpersonal conflict which possibly escalates in workplace bullying [8] .

### 5.1.2. Bullying and Sickness Absence

The phenomenon of workplace bullying refers to the prolonged and repeated exposure to frequent aggressive and hostile behaviors at work, such as excessive criticism, withholding necessary information, spreading of rumors and social isolation [9].

Although a generally accepted definition of bullying is lacking in literature, there are some consistencies between the most commonly used definitions. There is agreement that bullying consists of repeated negative acts towards one or more victims [9-12]. Some definitions explicitly mention the persistent character of the bullying behavior [11, 12] or underline that the victim perceives difficulties to defend him or herself [9] and so point at the imbalance of power. As proposed by Notelaers [13], bullying essentially is a process, frequently triggered by a work-related conflict [14] in which the victim becomes increasingly targeted and demonstrates an inability to cope with the whole situation [15].

While classical psychosocial work stressors (such as job demands, control, support) have frequently been studied, the impact of being a victim of bullying on individual health, well-being and sickness absence is less investigated. Nevertheless, bullying is reported to be a serious problem, with possibly severe consequences for health and well-being of the individual worker. Being a target of bullying has been associated with psychological problems [16-18], but also with physical illness [19].

Only a few authors [20-23] demonstrated that bullying prospectively increased the risk for sickness absence, however these studies were mainly restricted to populations consisting of healthcare workers.

Another notable finding is that, when investigating several psychosocial risk factors, bullying seems to have the strongest association with sickness absence [24]. In line with these findings, we assume:

> *Hypothesis 1:* High levels of bullying are positively associated with long-term sickness absence during follow-up.

### 5.1.3. Interplay between Job Strain and Bullying

Both organizational and individual factors have been described as potential antecedents of workplace bullying. Individual factors related to being a victim of bullying are shyness [25], neuroticism [26] and low social skills [27]. Workplace and organizational factors that are demonstrated to be associated with bullying at work are diverse: high workload [11, 28], low work control [25, 28, 29], role conflicts [25], role ambiguity [25], change at work [30] and job insecurity [30]. Most studies investigating the determinants of bullying are based on the "work environment hypothesis", which essentially assumes that workplace bullying can be attributed to a stressful work environment [11, 28]. A general remark on the majority of the literature is that the link with an explanatory framework is lacking. Until now, only a few authors applied existing job stress models in order to explain the origin of bullying. The JDC-model was tested in relation to workplace bullying and these studies supported the strain hypothesis indicating that high job strain ( which is the combination of high demands and low control) leads to reports of bullying [29, 31-33].

In a qualitative study, examining the antecedents of workplace bulling, Ballien proposed a three-way-model explaining how job stress possibly creates a matrix for workplace bullying [34]. One of the pathways, explaining the link between job stress and bullying is based on the frustration-aggression hypothesis [35]. A worker who experiences "frustration", because of job strain, may react with an inefficient coping behavior (eg. persistent complaining about the situation and distancing from work with decreased performance). This behavior possibly results in confronting the existing habits in the workplace or in violating expectations, which in turn leads to reactive behavior of the co-workers. In this manner, the worker, experiencing job strain, puts him- or herself into a risk-full situation for victimization by others. Yet, it is also possible that a worker confronted with work-related stressors, has less energy and strength and becomes exhausted. These reduced workers' resources can imply that they become "easy targets", who offer little resistance against workplace bullying [36]. In line with this framework, we assume:

> *Hypothesis 2:* High levels of job strain are positively associated with high levels of bullying.

In order to disentangle the intermediate steps from job stress to the occurrence of health problems and related sickness absence, the complex interplay between both stressors (job strain and bullying) in relation to sickness absence will be examined. As far as we know, only one author has combined both stressors in order to explain the relation between job strain and a health outcome, revealing that workplace bullying mediated the relation between job strain and depression/sleep disturbances [37]. However, several methodological shortcomings can be mentioned on this study. The results are established on cross-sectional findings, which hamper the possibility to draw conclusions with respect to causality. Second, all results are based on self-reports, which produces a problem of common method bias. Third, the applied mediation analysis, based on the procedure proposed by Baron and Kenny, has several limitations [38].

The present study wants to overcome these limitations and get insight into the processes contributing to the health harming effect of job strain, by using long-term sickness absence as an objective outcome measure, based on registered data in a longitudinal design. Furthermore, the application of new

statistical methods, gives us the opportunity to get deeper knowledge on the relationship between several stressors and their consequences on ill-health. This paper wants to integrate the JDC-model and bullying concepts in relation to long-term sickness absence (LTSA), in order to get more insight into the complex interplay between job strain and bullying. Based on the previous findings of Baillien and Takaki [31, 34] , we hypothesize that job strain will be indirectly associated with LTSA through workplace bullying. Job strain, which is the combination of high job demands and low control, possibly creates a work atmosphere in which bullying behavior will escalate, in turn causing sickness absence. We hypothesize that at least a part of LTSA caused by job strain, can be explained by being a target of bullying (figure 1). The aim of this study was to test a mediation model in which the indirect relation of job strain to LTSA through bullying was estimated, using structural equation modeling.

**Figure 1**: hypothesized model

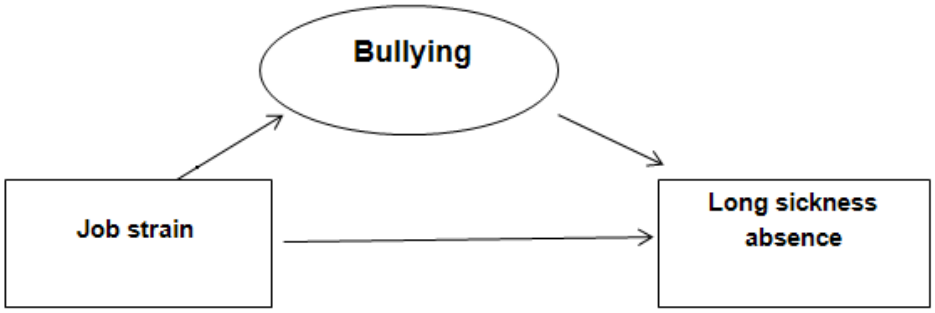



**Figure 5.1.**: Hypothesized model

*Hypothesis 3:* Job strain is indirectly associated with LTSA through bullying

## 5.2. Methods

### 5.2.1. Study Population and Procedure

The Belstress III study, conducted in 2004 in seven Belgian companies (comprising public administration, health care and social work sectors and manufacturing company), was a follow-up study aiming to identify the risk factors for sick leave at work [39].

The workers, aged 30 to 55 years, were invited to participate in the study. The response rate was 30.4%, representing a total of 2983 participants, and was lower in the lower occupational groups. Analysis of the non-respondent characteristics revealed no difference with respect to gender or age.

The study population consisted of 1372 men and 1611 women, and the majority (72%) was employed full-time. At baseline, all participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and characteristics of the psychosocial work environment. The Belstress III study was approved by the ethics committees of the Ghent University Hospital and the Faculty of Medicine of the Université libre de Bruxelles.

### 5.2.2. Measures

#### a) Job strain

Job strain was operationalized, using the recommended scales "job demands" and " decision latitude" of the Job Content Questionnaire (JCQ) [2]. The JCQ is based on the JDC-model and is one of the most widely used instruments to assess the psychosocial work environment. Job demands were measured using the five-item scale, referring to mental work load, organization constraints on task completion and conflicting demands. Response choices were presented on a four-level Likert-type scale, ranging from one ("strongly disagree") to four ("strongly agree") and a sum score was calculated to measure job demands. An example item is: "My job requires that I work very fast". Decision latitude was composed of the sum score of two subscales: "skill discretion" consisted of six items referring to the level of skill and creativity required on the job and "decision authority" was composed of three items concerning the possibilities for workers to make decisions about their work. Responses on these items ranged from one ("strongly disagree") to four ("strongly agree"). An example item is: "My job allows me to take my own decisions". Job strain was defined as the ratio of job demands over decision latitude.

#### b) Bullying

Bullying was questioned using nine items, based on the scale of Quine [40]. Three items refer to "isolation", four items assessed the dimension "destabilization", while the dimension "threat to personal standing" was measured using two items. Response options on all nine items were: "yes, absolutely", "rather yes", "rather no", "absolutely not". An example item of the "isolation" dimension is: "At my work, necessary information is withheld from me". An example item of the 3destabilization" dimension is: "My efforts at work are constant undervalued". An example item of the "threat to personal standing" dimension is: "I am a victim of verbal and non-verbal threats".

#### c) Sickness absence

The objective sickness absence data were collected prospectively during 12 months follow-up, starting from the day on which the questionnaire was filled out. The registered data were obtained from the personnel administration departments of the participating companies. In Belgium a medical certification for absences of more than one day is required, to benefit from guaranteed salary and medical insurance. Subsequently, the sickness absence registration is expected to be highly accurate. Complete sickness absence data could be gathered for 2876 participants; 107 were lost during follow-up. This drop-out was mainly due to resignation or dismissal, and not attributable to health-related reasons.

Former research investigating the relation between bullying and sickness absence spells of a certain duration considered sickness absence spells varying between 4 days and 6 weeks [12, 20, 22], revealing an inconsistency regarding the definition of sickness absence. Since earlier studies clearly demonstrated a relationship between bullying and depression and mental health problems [41], we hypothesized that bullying possibly harms the health of the worker, rather than it would solely reflect the coping behavior as an attempt to escape from the negative environment. Consequently, we decided to use a

measure including long-term sickness absence spells, reflecting the health status of workers [42] and explicitly not to focus on absence frequency in terms of number of episodes (which is known to be more related with coping behavior). Since the time lag between exposure and outcome was only 12 months, it is not warranted to restrict the outcome to particularly long-term sickness absence spells of for instance 4 weeks or more. In this study, a long spell of sickness absence was defined as at least 15 consecutive days of sickness absence during the follow-up period.

**d) Covariates**

The respondents were questioned about several socio-demographics, health behaviors, self-rated health, the occurrence of long-term sickness absence during the preceding year and neuroticism. The factors included as covariates were considered to be potential risk factors for sickness absence and could therefore act as confounders of the relation between job strain, bullying and sickness absence [43].

Socio-demographic control variables included age (continuous variable), gender (male/female), educational level and occupational group. Low educational level was defined as primary school and the first three years of secondary school level, medium education as secondary school level and high education as high school or university. Occupations were defined according to the International Standard Classification of Occupations [44] and grouped into executives, white collars and blue collars. Company was retained as a possible confounding variable, since important differences in work stressors and sickness absence are known to occur between companies.

Health behaviors comprised current smoking habits (yes/no), alcohol use and body mass index (BMI). Excessive alcohol consumption was defined as an average of more than three units per day for men and more than two units per day for women [45]. BMI was calculated as the self-reported body weight (in kg) divided by the square of the reported height (in m) and was entered as a continuous variable in the analyses. Self-rated health was evaluated by the following question: “How do you generally assess your health?”, with five response categories. The variable was dichotomized: very good or good versus average, bad or very bad. The respondents were also questioned if they had a long-term sickness absence (at least 15 consecutive days) episode during the preceding year (yes/no).

Finally, a measure to assess the personality factor neuroticism was included in the questionnaire. One of the main problems for the interpretation of causal relationships in stress research, is the effect of “third variables”, which possibly affect the stressors and the outcome by using the same method [46]. Since personality plays a role in the perception of job strain, bullying and the attitude towards sickness absence, we included a personality factor as confounding factor in the model. The personality theory is mostly dominated by the five-factor model [47]. Of these five factors, especially neuroticism, which is considered as a general tendency to experience a negative affect, such as fear, sadness, or anger is expected to be involved in the response to stressors [48]. Therefore, the model was adjusted for neuroticism. Neuroticism was measured, using a scale, derived from the NEO Five-Factor Personality Inventory, consisting of 12 items. Respondents were asked to rate on a five-point Likert-type scale (one= strongly disagree; five= strongly agree), the extent to which each statement corresponds to their perception of themselves.

### 5.2.3. Statistical Analysis

Structural equation modeling was performed with Mplus version 6 software [49]. The Weighted Least Squares Means and Variance adjusted (WLSMV) estimation method was used for binary dependent variables. Scaling of the latent variables was done indirectly by fixing the factor loading of the first

observed item at one. Pairwise deletion was used for handling missing data with categorical outcomes, which resulted in an effective sample size of 2376 employees. A number of fit indices were considered to assess the fit of the proposed model to the empirical data [50]. The overall $\chi 2$ fit index is known to be largely influenced by sample size, tending to over-reject models with large sample size, and was therefore not used in drawing conclusions. For the Root Mean Square Error of Approximation (RMSEA), a value <.06 was considered as a good fit, a value <.08 was considered as an acceptable fit and a value >.10 led to rejection of the model [51, 52]. For the Comparative Fit Index (CFI) and the Tucker–Lewis Index (TLI), a threshold value >.90 was considered as a good fit [53]. Standardized factor loadings >.50 were perceived as good, loadings >.40 indicated an acceptable correlation and those <.40 were perceived as low. Estimation of the mediation proportion was calculated according the formula for a model with one intermediate variable, which is the ratio of the parameter estimates of the indirect effect over the total effect [54].

Before specifying the hypothesized relations among the study variables, we estimated the measurement model for bullying, by conducting an exploratory factor analysis (EFA), followed by a confirmatory factor analysis (CFA). The measurement model for bullying was integrated in the full structural model, to test the mediation model (figure 1).

Job strain, defined as the ratio of job demands over decision latitude, was included as an observed variable in the structural model. This approach was selected in order to linearly model the balance between job demands and decision latitude which enables us to assess the impact of a continuous measure of exposure. The Flemish version of the JCQ showed good reliability and validity in previous Belstress study samples [55]. A preceding EFA showed reasonable results for the expected three-factor solution (RMSEA= .083, CFI= .946, TLI= .906), revealing the scales job demands and the two subscales (decision authority and skill discretion) of decision latitude. Factor loadings were acceptable, except for the items “conflicting demands” and “repetitive work”, which was in line with earlier research [2].

The 11 covariates, mentioned above, were treated as exogenous variables and predicted the main variables in the model (job strain, bullying and sickness absence). All covariates were observed variables, except for neuroticism, which was measured by a 12-item scale. However, we included neuroticism also as an observed variable, since the neuroticism scale is a widely used and sufficiently validated instrument, which has been developed as a clear separate dimension within the five-factor personality model [47].

## 5.3. Results

Table 5.1 (sample characteristics) demonstrates that the majority of the sample was white collar or executive and that only 20% of the total study population was lower educated. Mean age was 43,3 (+/- 6,74) years. About 18% of the sample had at least one period of LTSA during follow-up.

| Variable | Total study sample (n=2983) |
|---|---|
| **Socio-demographic variables** | |
| Sex: n (%) | |
| Men | 1372 (46) |
| Women | 1611 (54) |
| Age ( years): mean (SD) | 43.3 (6.74) |
| Educational level: n (%) | |
| Low educated | 617 (20.8) |
| Medium educated | 1031 (34.7) |
| High educated | 1323 (44.5) |
| Occupation: n (%) | |
| Executive | 719 (25.2) |
| White collar | 1826 (64.1) |
| Blue collar | 305 (10.7) |
| **Lifestyle variables** | |
| Body Mass Index (kg/m²): mean (SD) | 25.1 (4.08) |
| Smoking: n (%) | 816 (27.5) |
| Excessive alcohol use: n (%) | 619 (21.1) |
| **Health-related variables** | |
| Poor self-rated health: n (%) | 943 (32.1) |
| **Work- related variables and sickness absence figures** | |
| Job strain: mean (SD) Range: 0.13-1.58 | 0.46 (0.12) |
| Bullying: mean (SD) Range: 9-36 | 13.7 (4.85) |
| Long term sickness absence: n (%) | 522 (18.2) |
| Self-reported long sickness absence during preceding year: n (%) | 555 (21.9) |
| **Personality** | |
| Neuroticism: mean (SD) Range: 12-60 | 30.8 (8.14) |

**Table 5.1.:** Descriptive socio-demographic, life style, health- and work-related variables in the total study population.

In table 5.2, the intercorrelations (Pearson correlations) for all study variables and constructs are presented. LTSA was significantly correlated with all other study variables.

| VARIABLES | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Age | 43.3 | 6.74 | 1 | | | | | | | | | | | | |
| 2. Gender | | | -.03 | 1 | | | | | | | | | | | |
| 3. Educational level | | | -.15*** | .11*** | 1 | | | | | | | | | | |
| 4. Occupation | | | -.01 | .06** | -.49*** | 1 | | | | | | | | | |
| 5. Smoking | | | .05** | -.00 | -.15*** | .09*** | 1 | | | | | | | | |
| 6. Alcohol consumption | | | .08*** | -.08*** | -.08*** | .03 | .10*** | 1 | | | | | | | |
| 7. Bmi | 25.1 | 4.08 | .14*** | -.16*** | -.17*** | .07*** | -.06** | -.00 | 1 | | | | | | |
| 8. Self-rated health | | | .14*** | .05** | -.11*** | .11*** | .14*** | .06** | .16*** | 1 | | | | | |
| 9. Bullying | 13.68 | 4.85 | .03 | -.05** | -.12*** | .13*** | .05** | .02 | .08*** | .21*** | 1 | | | | |
| 10. Job strain | 0.46 | 0.12 | .00 | .16*** | -.04 | .11*** | .06** | -.06** | .03 | .18*** | .38*** | 1 | | | |
| 11. Long sickness absence | | | .08*** | .07*** | -.13*** | .11*** | .08*** | .04* | .10*** | .17*** | .10*** | .10*** | 1 | | |
| 12. Previous sickness absence | | | .02 | .05** | -.12*** | .15*** | .09*** | .04* | .06** | .20*** | .11*** | .10*** | .18*** | 1 | |
| 13. Neuroticism | 30.80 | 8.14 | .06** | .18*** | -.04* | .12*** | .07*** | .06** | .00 | .32*** | .36*** | .30*** | .13*** | .12** | 1 |

Notes: N= 2983; *p<.05; ** p<.01;*** p<.001.

**Table 5.2:** Means, standard deviations and (Pearson) correlations among study variables

### 5.3.1. Measurement Model Bullying

In a first step, the measurement model for bullying was checked with a EFA, which resulted in a three factor solution with an acceptable to good model fit (RMSEA= .070; CFI= .991; TLI= .987) and factor loadings >.59. This three-dimensional structure was in line with the expected structure of the original instrument: a factor "isolation" was derived, loading on two items (withholding information; ignoring); a "destabilization" factor, which loaded on five items (unreasonable refusal of applications for leave; shifting of goal posts; undervaluing of efforts; demoralization; removal of responsibility areas) and a "threat to personal standing" factor loading on two items (threats; inappropriate jokes).

A first-order CFA with three factors revealed high modification indices relating to covariance between residuals of some of the items. Based on these modification indices and on theoretical assumptions that some items may have common causes other than the latent factors of the proposed model, four covariances between error-terms were allowed for. Firstly, covariance between the error-terms of the "demoralization" item (dimension "destabilization") and both the "threats" and "jokes" items (dimension "threat to personal standing") were allowed for, since persistent and constant demoralization can also be considered as a threat to personal standing. Second, covariance between error-terms of the "refusal" item and the "shifting of goal posts" item were tolerated, which are in fact both behaviors typically occurring in a hierarchical situation, that pushes the victim in a passive, uncontrollable situation. Finally, also covariance between error-terms of items "ignoring" (dimension "isolation" and "jokes" (dimension "threat to personal standing") were allowed for: ignoring in an extreme form can be perceived as a personal threat and mockery. This first-order CFA with three factors, also demonstrated high correlations between the factors ( > .76).

A second-order CFA with the three factors at the first level and one overall factor at the second level, demonstrated a good model fit (RMSEA= .048, CFI= .996, TLI= .994) with factor loadings >.70. Small negative residual variance for the first-order factor "destabilization" could be observed: the correlation with the bullying factor was 1.001, indicating that the first-order factor "destabilization" is a perfect indicator of the second-order factor "bullying". Therefore, the residual variance of the "destabilization" factor was fixed at zero [49]. The measurement model was overidentified, which allows interpreting the fit indices.

This measurement model was retained as final model, to integrate in the full structural model.

### 5.3.2. Final Structural Model

After establishing a measurement model for bullying, the proposed hypotheses were examined. In figure 2, the standardized path coefficients are displayed in the final structural model, which demonstrated adequate goodness of fit measures (RMSEA= .034; CFI= .998; TLI= .983). This model revealed that job strain was significantly related to the latent bullying factor, which confirms hypothesis 2 ( assuming high levels of job strain are positively associated with high levels of bullying). In line with hypothesis 1 (which assumes that high levels of bullying are positively associated with long-term sickness absence during follow-up), bullying was significantly associated with LTSA, while no direct association between job strain and sickness absence was demonstrated.

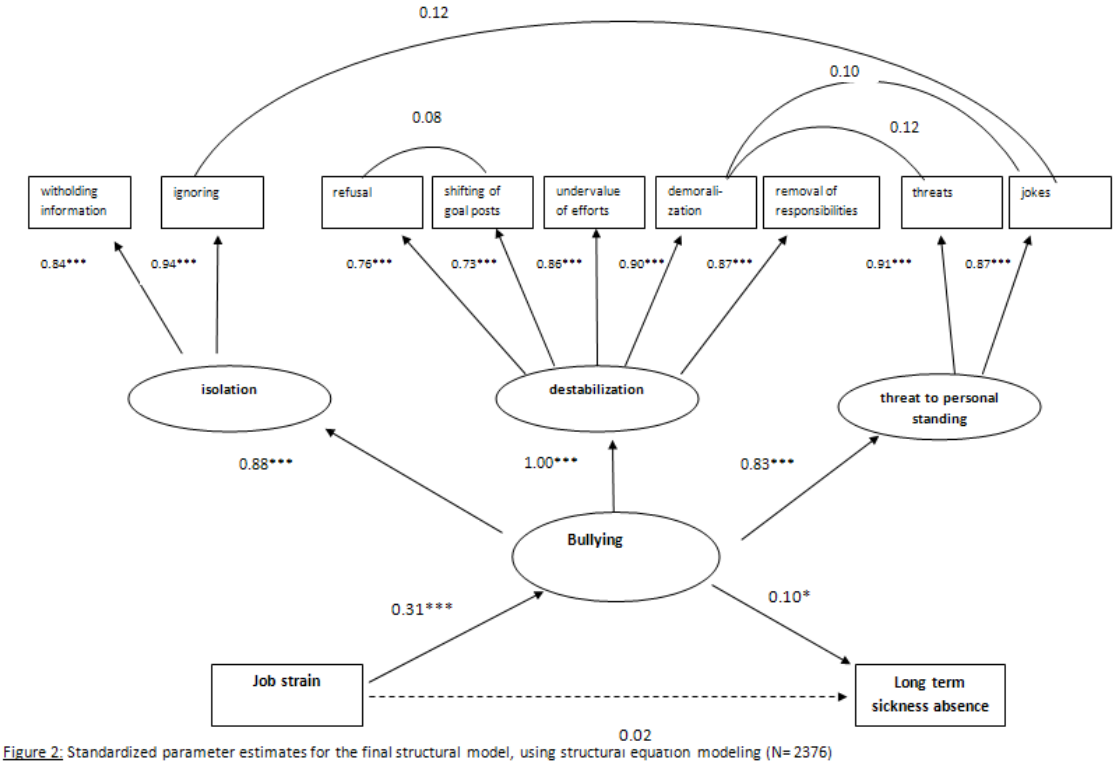



Figure 2: Standardized parameter estimates for the final structural model, using structural equation modeling (N= 2376)
The standardized regression coefficients involving the covariates are displayed in table 4.
Model fit: RMSEA= .034; CFI= .998; TLI= .983
Dotted lines: not significant; ***: p-value <.001; **: p-value <.01; * p-value<.05

**Figure 5.2.:** Standardized parameters estimates for the final structural model, using structural equation modeling (n=2376)

In table 5.3, the direct relation of job strain and indirect relation of job strain through bullying with LTSA are presented. From this table, a significant indirect association can be derived, suggesting that bullying is an intermediate variable between job strain and LTSA, which therefore supports our third hypothesis (postulating that job strain is indirectly associated with LTSA through bullying). Calculation of the mediation proportion demonstrated that about 60% of the relation between job strain and LTSA could be explained by the indirect association through bullying.

| | Standardized parameter (S.E) | p-value |
|---|---|---|
| Direct effect | 0.02 (0.27) | 0.59 |
| Indirect effect through bullying | 0.03 (0.12) | 0.02* |

Notes: SE= Standard Error.;* <.05; **<.01; ***<.001

**Table 5.3.:** Direct and indirect effects of job strain on sickness absence, using structural equation modeling (N=2376)

Table 5.4 displays the standardized path coefficients from the covariates to the main variables in the model.

| Main variables / Covariates | Job strain | Bullying | Long-term sickness absence |
|---|---|---|---|
| Gender | .103*** | -.163*** | .107** |
| Age | -.032 | -.013 | .060 |
| Educational level | .000 | -.029 | -.066 |
| Occupational group | .052* | .046 | .074** |
| Company | .004 | -.069** | -.129*** |
| Smoking | .029 | -.003 | .052 |
| Alcohol consumption | -.062** | .007 | -.018 |
| BMI | .043* | .024 | .089** |
| General self-rated health | .057** | .074** | .091** |
| Previous long term sickness absence | .036 | .024 | .148*** |
| Neuroticism | .253*** | .314*** | .067 |

Notes: *p<.05; ** p<.01;*** p<.001.

**Table 5.4.:** Overview of the standardized path coefficients for the covariates in relation to the main variables, using structural equation modeling (N= 2376).

### 5.3.3. Supplementary Analyses

An alternative analysis was conducted, to examine the reversed pathway. Theoretically, it could be assumed that bullying leads into a deterioration of work environment, with increased job strain; which would subsequently lead to sickness absence. However, the results of this analysis revealed no indirect association of bullying with sickness absence through job strain and consequently contradicted the reversed pathway.

## 5.4. Discussion

The main purpose of this study was to analyze a mediation model in which the indirect association of job strain with bullying on LTSA was estimated. We believe that this study contributes to the existing literature on job stress and bullying, since it enhances scientific understanding of the complex interplay between both stressors, using new statistical methods in the field of causal inference. An objective, prospective outcome measure was opted for and alternative analyses were conducted to compare their fit to the data.

Mediation analysis, using structural equation modeling, was applied to estimate the direct and indirect associations of job strain with sickness absence. An additional analysis (results not shown) was

conducted to exclude the possibility of moderation: no significant interaction effect between bullying and job strain in relation to LTSA was observed. Overall, our results thus suggest that exposure to job strain creates circumstances in which a worker may likely become a target of bullying, which in turn is related to sickness absence. Bullying may be an intermediate pathway through which job strain is related to increased sickness absence. This finding is generally in line with the "work environment hypothesis" of bullying [11, 28], which is now followed by most investigators in bullying research. This situational interpretation emphasizes the importance of the organizational work factors, such as bad job content, in the origin of bullying. Several authors indeed demonstrated that the occurrence of bullying was significantly associated with a number of environmental work characteristics [11, 25, 28-30]. The work of Ballien further enhanced insights in this field, by explaining bullying in terms of the most leading job stress model of Karasek as a conceptual framework. Generally, job demands increase the probability of being a target of bullying, while high control protect against being bullied [31, 32]. This was also suggested by Takaki et al. demonstrating bullying as a mediator in the relation between job strain and sleeping problems and depression [37]. Accordingly, our research extends these findings by underscoring bullying as an intermediate variable in the well-established relation between job strain and sickness absence. Although the effect size of the observed indirect effect is small, the importance of our results should not be neglected. These findings have to be seen in the light of former research revealing that job strain accounts for a rather restricted amount of the variance in sickness absence [56], which is essentially defined by multifactorial causes. Moreover, the psychosocial work climate has the potential of being ameliorated through preventive measures on a collective basis, which may be, although reaching a minor effect, possibly more efficient than implementing worker specific and more health oriented preventive measures.

A second important result is that we could not find support for the opposite pathway: job strain was not an intermediate variable in the relation between bullying and sickness absence. This result, additionally adding evidence to our third hypothesis, is in line with the findings of Ballien et al. [32], who also found no support for reversed causation in their cross-lagged study. Generally, these results indicate that bullying did not have a harmful effect on the work environment and therefore contradict alternative stress frameworks, such as the "model of conservations of resources", which is based on the supposition that people strive to retain their resources and that what is threatening to them means a potential loss of these resources [57].

Furthermore, our findings underline the value of one of the most influential and dominant models in job stress research and add evidence for the explanatory use of the JDC-model in the origin of bullying. Also Ballien demonstrated that this framework is valuable when investigating antecedents of bullying [32, 33].

Finally, our study adds evidence to the scarce literature revealing bullying as a predictor of sickness absence, which was until now only demonstrated in study samples, mainly consisting of health care workers [20-23].

### 5.4.1. Methodological Considerations

This study has some drawbacks that need to be mentioned. The main limitation is that both job strain and bullying measures are based on cross-sectional self-reports. Several precautionary measures were taken to reduce common method bias in our results: confidentiality was guaranteed to lower social desirable answers, sickness absence measures were based on objective registrations and the relations

were adjusted for several possible "third variables", including a measure for negative affectivity [58]. Because of the cross-sectional nature of the questionnaire assessment, causality of the relations cannot be established. Even if additional analysis exploring the reversed pathway showed no indirect association of bullying through job strain, which is moreover in line with the theoretical background of the work environment hypothesis, our study design does not permit concluding that job strain causally effects LTSA through bullying. In order to counteract the limitation that no statistical control could be conducted for prior measures of the main variables in the mediation model, substantive control of confounding was taken care of. Particularly baseline self-reported LTSA and negative affectivity are very likely to correlate with prior exposure to job strain, bullying and LTSA. The second limitation is the rather low response rate, which possibly leads to a selection bias in the population. Although no important differences in age and gender were revealed, we were not able to investigate if sickness absence levels differed between non-respondents and respondents. Third, it should be noted that participants of the Belstress III study were not recruited from a representative sample of the Belgian working population. Therefore, caution should be made in generalization of the results. Nevertheless, representativeness is less crucial than variation in exposure in analytical studies like this one, where possible relationships are examined [59]. A fourth limitation, is the use of the bullying questionnaire based on the Quine inventory, which has rather limited application until now. This scale has however some advantages: the results are based on multiple items per dimension, which enables assessment of the psychometric quality of the inventory. With CFA it was possible to recognize the different latent factors, proposed by the author, which additionally support the validity of this questionnaire. A last issue, worth noting, is the rather short follow-up period of one year. Future research has to establish the ideal time frame to investigate the full effect of job strain on bullying and sickness absence.

Besides these limitations, some particular strengths have to be mentioned. There is the use of the structural equation approach to assess the mediation model, which is argued to be superior to the more conventional Baron and Kenny's method, to establish mediation, since a simultaneous estimate is made instead of assuming three independent equations [38]. With respect to this specific approach, it should be noted that assumptions required for a reliable estimation of the parameters were fulfilled. Firstly, the sample size, which is advised to be at least 10 times the number of freely estimated parameters in the final, structural model, was sufficiently large. Second, the measurements for the mediator and the outcome can be assumed to be largely free of measurement error. The outcome (LTSA) was based on objective, prospectively registered sickness absence measurements, which are obviously more reliable than self-reported figures. For bullying, the measurement model shows a factorial structure corresponding to the proposed model and demonstrates good fit with the data, which underlines the construct validity of the bullying measure. Third, the possibility of unmeasured common causes of the main variables has to be excluded. Therefore, multiple possible confounding factors were integrated in the final structural model, including baseline LTSA, self-rated health and a personality factor assessing negative affectivity. Finally, the world wide used JDC-model was applied to assess job stress, which is a reliable theoretically-driven measure.

### 5.4.2. Recommendations for Further Research

Although this study increases the insight in some important processes between job stress and sickness absence, many aspects in this area remain unclear. Therefore, several recommendations for further research can be made. A first issue relates to investigating whether sickness absence in bullying victims represents real ill-health (required to recover from the illness) or rather a coping behavior to escape from the adverse work environment. Additionally, this study only focused on actual sickness

absence behavior as an outcome and therefore did not capture the complete attendance dynamic, since no presenteeism figures were included in the analysis. It is recommended to extend sickness absence figures with presenteeism, which will lead to more insight into the attendance dynamic as a behavioral decision process in response to the perception of several job stressors. A second aspect that needs further study, is the precise physiological mechanism through which bullying exerts its ill making effect. Third, also other job characteristics, such as job insecurity, cognitive and emotional demands should be integrated in a conceptual model to further elaborate the role of bullying in the effect of the work environment on sickness absence. Fourth, besides the interplay between bulling and specific features related to the work content, also the particular role of social support should be subject of study. Finally, studies with measurement of both independent, mediator and dependent variables on multiple time occasions, would allow getting more insight in the complex causal relationship between several stressors and the outcome.

### 5.4.3. Practical Implications

The main findings of this study yield some important implications for management strategies reducing sickness absence due to bullying. While former research underscored the importance of conflict management strategies in the prevention of bullying [60], this study also highlights that remodeling jobs to reduce job strain may be important. Our work reveals that using the JDC-model as a framework may be appropriate to prevent bullying and sickness absence. Reducing job demands and increasing control may prevent bullying behavior on the workplace, which would have beneficial effects on the sickness absence figures.

### 5.4.4. Conclusions

To summarize, we believe that our study offers a valuable contribution to the existing literature by establishing the important role of bullying in the relation between work characteristics and sickness absence. The results generally extend the widely accepted work environment hypothesis of bullying, by suggesting the intermediate pathway of bullying in the relation between job strain and LTSA.

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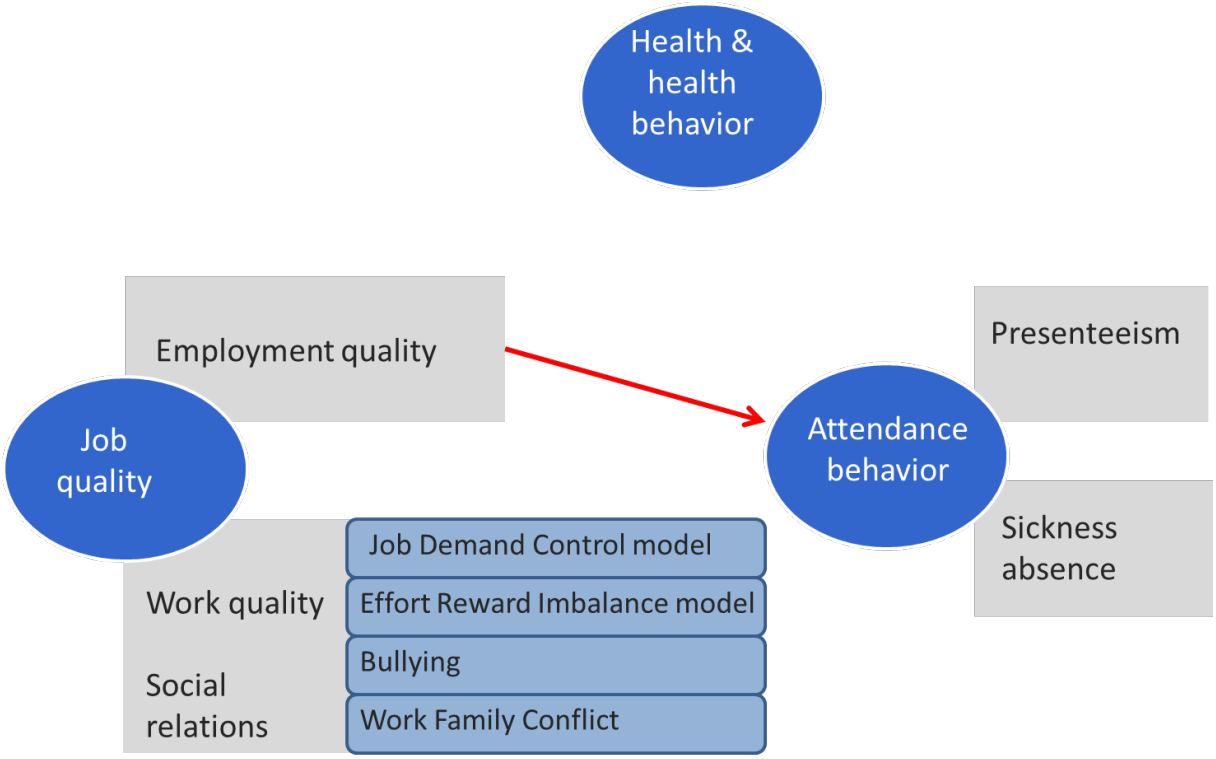
# Chapter 6.
# Relation between employment quality and attendance behavior




Based on:

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# ABSTRACT

## Objectives:

Several studies demonstrated a relation between low employment quality and ill health. Research also showed an association between low employment quality and lower sickness absence, which may be explained by presenteeism. Therefore, this study aimed to explore the relation between three indicators of low employment quality (long working hours, precarious employment and job insecurity) and attendance behavior.

## Methods:

The cross-sectional association between low employment quality and attendance behavior was investigated in 28.999 workers of the fifth wave of the European Working Conditions Survey. Attendance behavior was operationalized as different combinations of sickness absence and presenteeism. Multilevel multinomial logistic regression analysis was conducted, while adjusting for several confounders.

## Results:

Those working more than 48h/week, had a higher risk to report presenteeism without sickness absence and presenteeism with sickness absence. The risk to report sickness absence without presenteeism was significantly lower for those with long working hours.
Workers with a precarious contract were less at risk to report absenteeism without presenteeism and the combination of both presenteeism and absenteeism compared to those with an indefinite contract.
Finally, for workers perceiving job insecurity, the risk for presenteeism without sickness absence was significantly higher.

## Conclusion:

This study confirms that indicators of low employment quality are associated with attendance behavior. The findings suggest a complex behavioral mechanism in workers facing low job quality employment, which may result in higher presenteeism in case of job insecurity and long working hours.

## 6.1. Introduction

Since the seventies, the globalization of the labor market - associated with an increasing internationalization of trade, investment and finance - has led to a shift from the traditional employment relationship into a more post-fordist way of economic regulation with emphasis on flexibility and competition. This includes more non-standard working arrangements, with atypical contracts and aberrant working time arrangements, and is characterized by considerable uncertainty, instability and job insecurity in several industrial societies[1].

At the same time, job quality is receiving growing interest from several authorities in Europe, which is reflected in the Lisbon strategy and the objectives of the EU to increase both employment rates and job quality by 2020[2]. Generally, job quality can be considered to include both work quality and employment quality[3]. The relation of work quality, which comprises working conditions and job content related issues such as the psychosocial working environment, and health has been already extensively investigated. Alongside, the association between employment quality, which includes employment conditions referring to the mutual agreement concerning working hours, wage and so on, and health is also an emerging topic of investigation, since this aspect is especially affected by the changes in the labor market[3].

The association between several measures of employment quality, such as precarious employment and long working hours, and a variety of health indicators has been subject of investigation. A recent review clearly demonstrated that long working hours are associated with depression, anxiety, sleep and coronary heart disease[4]. Additionally, the association between long working hours and sickness absence, which can be considered as a measure of health and functioning[5], has been examined, suggesting long working hours being associated with less sickness absence spells[6-9]. A possible explanation may be that employees who are working long working hours, feel a high pressure at work and therefore perceive difficulties to take sickness absence[6, 7, 9]. This hypothesis is confirmed by other research, revealing a positive association between long working hours and presenteeism[10]. Regarding precarious employment, which may be seen as an objective indicator of job insecurity, a substantial part of the studies demonstrated an association with health problems, while some research also found associations with better health[11]. These conflicting findings possibly reflect differences in welfare systems or may be due to a healthy worker effect[12]. Precarious employment has also been associated with lower rate of absenteeism[13-15]. Furthermore, it has been demonstrated that the change from fixed term to permanent employment was followed by an increase in medically certified sickness absence[16]. Besides precarious jobs, the workers' perception of fear of job loss has been used as a subjective indicator of job insecurity. When applying this measure, the association between job insecurity and bad health outcomes is more consistent[11]. On the other hand, studies investigating the effects of job insecurity on sickness absence, are mostly conducted in situations of major downsizing, and revealed inconsistent results[17-20]. As proposed by Blekesaune[17], job insecurity can lead to both an increase and a decrease of sickness absence. The increase of absence due to job insecurity, is explained by the stress theory, which is basically stating that job insecurity causes stress and health problems. The decrease of absence rates can be explained by the healthy worker effect: unhealthy workers with frequent sickness absence will rather end up in unemployment during economic recession periods. But also the disciplinary theory, assuming that workers perceiving job insecurity will avoid to stay at home in case of illness, may be an explanation. The latter theory is supported by evidence from studies revealing a positive correlation between job insecurity and presenteeism[21, 22]. Furthermore, an association between precarious contract and presenteeism has been demonstrated in earlier research[23].

In conclusion, research suggests that indicators of low employment quality may be related to several adverse health outcomes, while a number of authors find evidence for an association with lower sickness absence rates. Most of the researchers hypothesized that this inconsistency could be explained by the finding that workers are forced into presenteeism in case of low employment quality, suggesting that the attendance behavior (or the decision to go ill at work or stay at home in case of illness) of an employee is influenced by the economic context and the employment quality. Therefore, this study aims to examine the associations between low employment quality indicators and several combinations of sickness absence and presenteeism, taking into account several demographic confounding factors, in a large dataset of European employees.

## 6.2. Material and methods

### 6.2.1. Study population

The fifth European Working Conditions Survey (EWCS) was carried out by Gallup Europe for the European Foundation for the improvement of living and working conditions, between January and June 2010[24]. This periodically conducted survey uses face-to face questionnaires at the participants' own home and aims to gather information on working conditions in countries in Europe. The survey includes information of almost 43.816 employed and self-employed workers aged 15 years and over within 34 countries (the EU27, Norway, Croatia, the former Yugoslav Republic of Macedonia, Turkey, Albania, Montenegro and Kosovo). The overall response rate was 44% for the fifth EWCS. Details on sampling design, methods and questionnaire are available elsewhere[24].
For the purpose of the present study, persons who were not employed or self-employed were excluded. The analysis was restricted to 28.999 employed workers from the 27 countries from the European Union.

### 6.2.2. Variables

**a) Dependent variable: Attendance behavior**

Attendance behavior was operationalized as the combination of self-reported sickness absence and self-reported presenteeism, based on the idea of Gustafsson et al.[25]. Self-reported sickness absence was measured using one question: "Over the past 12 months how many days in total were you absent from work for reasons of health problems?" The results were dichotomized into no absence (no) and at least one day of absence (yes). Self-reported presenteeism was assessed using the question: "Over the past 12 months did you work when you were sick?" The results also represented a binary variable (yes/no). From these two dichotomous variables, a combined variable for attendance behavior was created, with four categories: no presenteeism/no absenteeism; presenteeism /no absenteeism; absenteeism/no presenteeism; absenteeism/presenteeism.

**b) Independent variable: indicators of low employment**

Three independent variables were separately examined in relation with attendance behavior.

Long working hours were defined as working more than 48 hours/week, based on the European Working Time Directive[26], aiming to protect workers from health and safety risks associated with excessive and inappropriate working hours.
The variable precarious contract was created based on the answers to the question "What kind of employment contract do you have?" Workers with a fixed term contract or temporary employment agency contract were defined as having a precarious contract and compared to those with an indefinite contract. Those with an apprenticeship or other training scheme or without a contract were excluded.
Job insecurity was measured using the item "I might lose my job in the next 6 months". Those who positively answered on this question were considered as perceiving job insecurity.

**c) Covariates**

Several covariates were taken into account in the multivariate analysis in order to control for potential confounding: age (in years), gender, seniority (in years), self-rated health, job satisfaction, educational level and type of occupation.
Self-rated health was measured using the question "How is your health in general?", with the response options very good, good, fair, bad and very bad. The variable was dichotomized into very good and good versus fair, bad and very bad. Job satisfaction was assessed with the question "On the whole , are you very satisfied, satisfied, not very satisfied, or not at all satisfied with working conditions in your main paid job?" This variable was also treated as a dichotomous variable: (very) satisfied versus not very satisfied and not satisfied at all. The participants were also asked about the highest level of education or training that they have successfully completed. The results were classified into 3 categories: workers who had no education or completed primary school, workers who completed lower or upper secondary school and workers who additionally completed tertiary education.
The type of occupation was coded according to the International Standard Classification of Occupations, ISCO-88, of which the first level was used[27]: armed forces occupations, managers, professionals, technicians and associate professionals, clerical support workers, service and sales workers, skilled agricultural, forestry and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations.

### 6.2.3. Statistical analyses

All statistical analyses were performed using SPSS 21.0 software. Multinomial logistic regression models were used to assess whether the three employment quality indicators (precarious jobs, job insecurity and long working hours) were associated with attendance behavior. After establishing the crude associations, models were adjusted for age, gender, seniority, self-rated health, job satisfaction, educational level and type of occupation. Since data are demonstrating a hierarchical structure with workers clustered within countries, the models were estimated in a multilevel framework. Therefore, the SPSS mixed model procedure was used, with calculation of random intercepts. Results of the multilevel multinomial regression models are presented in relative risk ratio's with the corresponding 95% confidence interval. Variance of partition coefficients (VPC) were calculated to assess how much of the variance in the attendance behavior can be explained by difference between countries. Models were screened for multicollinearity between the independent variables according to the calculation of Variance of Inflation Factors. A p-value $<0.05$ was considered significant.
Although previous research demonstrated important gender differences in attendance dynamics[28], preliminary analyses did not reveal any significant interaction effect between gender and employment

indicators in relation with attendance behavior. Hence, the main analyses were not stratified for gender.

## 6.3. Results

Descriptive information of the study population is presented in table 6.1. A total of 28.999 workers, of which almost 47% is female, were included in the analysis. Mean age was 40,1 year (SD=11,7). About 14,3% of the sample was working in a precarious contract, while 17,2% was reporting job insecurity. 8,3% of the sample was working more than 48h/week. Workers who were reporting both absenteeism and presenteeism during the preceding 12 months, represented 21.1% of the sample, while 14,7% reported presenteeism without absenteeism. The situation of reporting sickness absence, without presenteeism occurred in 26,8% of the workers.

In table 6.2, cross-tabulations are demonstrated between the three indicators of low employment quality in relation with presenteeism and sickness absence.

Table 6.3 shows that long working hours was a significant factor in association with attendance behavior. The risk to report presenteeism without sickness absence or presenteeism with sickness absence (compared to those not reporting sickness absence nor presenteeism) was significantly higher for workers who are working more than 48h/week compared to those that are working less than 48h/week. Additionally, the risk to report sickness absence without presenteeism was significantly lower for those working more than 48h/week contrasted to those who are not.

| | Total group (n=28999) | Men (n=15384) | Women (n=13614) | p-value[a] |
|---|---|---|---|---|
| **Age: M (SD)** | 40.05 (11.71) | 40.16 (11.88) | 39.93 (11.51) | 0.09 |
| **Seniority: M(SD)** | 9.25 (9.16) | 9.84 (9.61) | 8.59 (8.57) | <0.001 |
| **Attendance behavior** | | | | |
| No presenteeism/ no absenteeism: n(%) | 10290 (37.5%) | 5586 (38.5%) | 4705 (36.3%) | <0.001 |
| Presenteeism/no absenteeism: n(%) | 4023 (14.7%) | 2126 (14.7%) | 1897 (14.6%) | |
| Absenteeism/ no presenteeism: n(%) | 7353 (26.8%) | 3997 (27.6%) | 3355 (25.9%) | |
| Absenteeism/presenteeism: n(%) | 5783 (21.1%) | 2790 (19.2%) | 2993 (23.1%) | |
| **Precarious contract: n(%)** | 3849 (14.3%) | 1859 (13.0%) | 1990 (15.9%) | <0.001 |
| **Job insecurity: n(%)** | 4637 (17.2%) | 2518 (17.5%) | 2119 (16.8%) | 0.09 |
| **Long working hours (>48h/week): n(%)** | 2385 (8.3%) | 1807 (11.9%) | 578 (4.3%) | <0.001 |
| **Self-rated health** | | | | |
| (Very) good: n(%) | 22912 (79.2%) | 12295 (80.2%) | 10617 (78.2%) | <0.001 |
| Fair or bad or very bad: n(%) | 6009 (20.8%) | 3043 (19.8%) | 2966 (21.8%) | |
| **Job satisfaction** | | | | |
| (Very) satisfied: n(%) | 24259 (84.3%) | 12851 (84.2%) | 11408 (84.3%) | 0.70 |
| Not satisfied (at all): n(%) | 4534 (15.7%) | 2416 (15.8%) | 2118 (15.7%) | |
| **Educational level** | | | | |
| Primary: n(%) | 1057 (3.7%) | 641 (4.2%) | 416 (3.1%) | <0.001 |
| Secondary: n(%) | 17916 (62.0%) | 9773 (63.7%) | 8143 (60.0%) | |
| Tertiary: n(%) | 9930 (34.4%) | 4917 (32.1%) | 5014 (36.9%) | |

[a] result of t test or $X^2$ test

**Table 6.1.:** Description of the study population

| Sickness absence | | | | |
|---|---|---|---|---|
| | | No | Yes | p-value[a] |
| Precarious contract | Indefinite contract: n (%) | 11347 (51.0%) | 10916 (49.0%) | <0.001 |
| | Precarious contract: n (%) | 2187 (58.7%) | 1537 (41.3%) | |
| Long working hours | No: n (%) | 13219 (52.0%) | 12188 (48.0%) | <0.001 |
| | Yes: n (%) | 1378 (59.9%) | 937 (40.0%) | |
| Job insecurity | No: n (%) | 11129 (51.5%) | 10491 (48.5%) | <0.001 |
| | Yes: n (%) | 2522 (55.9%) | 1987 (44.1%) | |
| Presenteeism | | | | |
| | | No | Yes | p-value[a] |
| Precarious contract | Indefinite contract: n (%) | 14389 (64.1%) | 8048 (35.9%) | 0.524 |
| | Precarious contract: n (%) | 2447 (64.7%) | 1337 (35.3%) | |
| Long working hours | No: n (%) | 16766 (65.5%) | 8824 (34.5%) | <0.001 |
| | Yes: n (%) | 1245 (52.7%) | 1117 (47.3%) | |
| Job insecurity | No: n (%) | 14195 (64.9%) | 7665 (35.1%) | <0.001 |
| | Yes: n (%) | 2775 (61.2%) | 1757 (38.8%) | |

[a] result of $X^2$ test

**Table 6.2.:** Relation between low quality employment indicators and sickness absence, presenteeism

| CRUDE MODEL | | | | |
|---|---|---|---|---|
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Long working hours[b] | 0.74 (0.65-0.85)*** | 1.99 (1.76-2.24)*** | 1.36 (1.20-1.54)*** | <0.001 |
| VPC | 0.10 | 0.07 | 0.20 | |
| **ADJUSTED MODEL[c]** | | | | |
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Long working hours[b] | 0.77 (0.67-0.89)*** | 1.76 (1.55-2.00)*** | 1.30 (1.14-1.49)*** | <0.001 |
| VPC | 0.11 | 0.08 | 0.22 | |

RRR: Relative Risk Ratio, 95%CI: 95% confidence interval, VPC: Variance of Partition Coefficient
*** p<0.001, ** p<0.01, * p<0.05
[a] reference category = no sickness absence in combination with no presenteeism
[b] reference category= no long working hours (=1)
[c] model is adjusted for gender, age, seniority, general self-rated health, job satisfaction, educational level and occupation type

**Table 6.3:** Results from the multilevel multinomial logistic regression analysis for long working hours in relation with attendance behavior

Precarious contract was significantly associated with attendance behavior, in the adjusted model (table 6.4). The results demonstrate that the risk to report absenteeism without presenteeism (compared to those reporting no absenteeism nor presenteeism) was significantly lower for workers with a precarious contract in comparison with those with an indefinite contract. Additionally, the risk to report absenteeism and presenteeism (in comparison with those reporting no absenteeism nor presenteeism) was also significantly lower for those with a precarious contract in comparison with workers with an indefinite contract. However, workers with a precarious contract have no increased risk to report presenteeism without sickness absence.

| CRUDE MODEL | | | | |
|---|---|---|---|---|
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Precarious contract[b] | 0.69 (0.63-0.76)*** | 1.03 (0.92-1.15) | 0.85 (0.76-0.94)** | <0.001 |
| VPC | 0.10 | 0.07 | 0.20 | |
| **ADJUSTED MODEL[c]** | | | | |
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Precarious contract[b] | 0.75 (0.68-0.84)*** | 0.93 (0.82-1.04) | 0.85 (0.73-0.94)*** | <0.001 |
| VPC | 0.11 | 0.08 | 0.23 | |

RRR: Relative Risk Ratio, 95%CI: 95% confidence interval, VPC: Variance of Partition Coefficient
*** p<0.001, ** p<0.01, * p<0.05
[a] reference category = no sickness absence in combination with no presenteeism
[b] reference category= indefinite contract (=1)
[c] model is adjusted for gender, age, seniority, general self-rated health, job satisfaction, educational level and occupation type

**Table 6.4.:** Results from the multilevel multinomial logistic regression analysis for precarious contract in relation with attendance behavior

Table 6.5 demonstrates that also job insecurity was a significant factor in relation with attendance behavior. The risk to report presenteeism without sickness absence (compared to the group without sickness absenteeism nor presenteeism) was significantly higher for workers perceiving job insecurity compared to those not perceiving job insecurity.

| CRUDE MODEL | | | | |
|---|---|---|---|---|
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Job insecurity[b] | 0.93 (0.85-1.02) | 1.32 (1.19-1.46)*** | 1.20 (1.09-1.32)*** | <0.001 |
| VPC | 0.09 | 0.07 | 0.20 | |
| **ADJUSTED MODEL[c]** | | | | |
| | RRR (95% CI )[a] | | | |
| | Sickness absence, no presenteeism | Presenteeism, no sickness absence | Presenteeism and sickness absence | p-value |
| Job insecurity[b] | 0.91 (0.83-1.01) | 1.25 (1.12-1.39)*** | 0.99 (0.89-1.10) | <0.001 |
| VPC | 0.11 | 0.08 | 0.22 | |

RRR: Relative Risk Ratio, 95%CI: 95% confidence interval, VPC: Variance of Partition Coefficient
*** p<0.001, ** p<0.01, * p<0.05
[a] reference category = no sickness absence in combination with no presenteeism
[b] reference category= no job insecurity (=1)
[c] model is adjusted for gender, age, seniority, general self-rated health, job satisfaction, educational level and occupation type

**Table 6.5.:** Results from the multilevel multinomial logistic regression analysis for job insecurity in relation with attendance behavior

## 6.4. Discussion

To the best of our knowledge, this is the first study addressing the association between three different indicators of employment quality and attendance behavior, operationalized as several combinations of presenteeism and sickness absence. This approach allows getting more insight into the complexity of the attendance behavior of the employee, in situations of low quality employment.

Generally, the results showed that the three low employment quality indicators under study were significantly related to different aspects of attendance behavior.
Employees working more than 48h/week reported significantly less sickness absence without presenteeism, but they were reporting more presenteeism (whether or not in combination with sickness

absence). This finding is in line with earlier research demonstrating an association between long working hours and presenteeism[10] and supports the hypothesis that these workers perceive an attendance pressure. Additionally, the finding that the indicator 'long working hours' is associated with a higher risk for the combination sickness absence and presenteeism may suggest that this low quality indicator is associated with health problems, which is supported by a recent study[29].

Our findings for the relation between precarious employment and attendance behavior underscore the results from existing literature, demonstrating an inverse relationship between precarious work and sickness absence. However, we did not find a significant relation between precarious employment and presenteeism without sickness absence, which is in contrast with a study investigating presenteeism in immigrant workers in Spain[23]. Aronsson also did not find a significant relation between type of employment and presenteeism in his study in the Swedish working population[30]. This study observed that workers with a precarious contract reported less presenteeism in combination with sickness absence. A possible explanation for this finding may be the healthy worker effect: workers with this kind of contracts may be a selection of healthier workers than those who are unemployed. Or workers in a precarious employment may be hesitant to report absenteeism and presenteeism, despite confidentiality was assured. Another reason can be the voluntary aspect, of which we do not have information in this questionnaire: it is possible that some workers have freely chosen for this type of contracts, while others are in an undesirable precarious employment. This group of precarious workers may thus consist of a rather heterogeneous population, in which the perception of job insecurity may vary.

Finally, also a significant relation between job insecurity and attendance behavior was observed. However, those perceiving high job insecurity were only reporting higher sickness presenteeism without sickness absence, while no significant relationship could be determined with the other attendance behavior categories. This suggest that especially the feeling of insecurity is creating a situation in which a worker will choose for continuing working despite illness, while workers with a precarious contract do not seem to have a higher risk for presenteeism. This finding is in line with the results of Virtanen et al[31], who concluded that contractual security and perceived security of employment are differently associated with health indicators. Generally, self-perceived job insecurity is considered to be a more potent stressor, since stress levels are determined by the feeling of fear for job loss[32].

The VPC demonstrated that the variance in the outcome sickness absence without presenteeism in relation with the separate low employment quality indicators can be explained for 11% by differences between countries. For presenteeism without sickness absence, about 8% of the variance was explained by differences between countries. This suggests that sickness absence is somewhat more influenced by differences between countries than it is the case for presenteeism, which may be explained by the differences in rules and compensation policies between countries in Europe.

Additional analyses stratified for gender (results not shown) yielded highly similar results, except for the female group working long hours, who did not demonstrate a significantly lower risk to report sickness absence without presenteeism.

Although this study adds evidence to the existing knowledge about the association between low employment quality and both absenteeism and presenteeism, several relevant limitations should be mentioned when interpreting these results. First, the results are based on self-reports, which may lead to less precise findings and may be argued to be biased by common method variance. Self-reported

sickness absence has been shown to be a valid measure in correlation research[33]. Furthermore, obtaining objective sickness absence and presenteeism figures is a quite challenging and time consuming task, explaining the widespread use of self-reports. With respect to the common method variance effect, it should be noted that the questions are formulated in a general manner and are not specifically asking about the relationship between the job quality indicator and sickness absence/presenteeism. Therefore, we suppose that the common method variance bias due to negative affectivity may be limited. A second limitation is the use of one day as cut-off value for both absenteeism and presenteeism, when defining the several combinations of attendance behavior. Therefore, an additional sensitivity analysis was conducted with alternative cut-off value of 5 days to define both absenteeism and presenteeism, which roughly leads to highly similar results. Another limitation is the cross-sectional design of this study not allowing to make causal interpretations. Also the rather low response rate may be source of participating bias. Unfortunately, information about the non-responders was not available. Further, the complete case analysis resulted in a loss of a high number of workers, which may have biased the results. Finally, we have no information about the voluntary aspect of the indicators of low employment quality: it is possible that some workers explicitly choose for working in a precarious contract or long working hours, which is obviously another situation than those who are forced to undergo this low quality employment jobs.

The major strength of the current study involved the assessment of different indicators of low employment quality and the combined evaluation of both presenteeism and sickness absence in a large dataset in different European countries. Although this approach includes the advantage integrating both sickness absence and presenteeism in one variable, it is very difficult to unravel the underlying mechanisms behind the results of the multinomial regression analysis.
A second strength of this study consists of the multilevel analysis which enabled to take the hierarchical structure of the data into account.

Despite the methodological considerations, the results of the present study have important implications for organizations and policy makers. First, this study confirms the finding that indicators of low employment quality are associated with both sickness absence and presenteeism. These findings suggest a complex behavioral mechanism in workers facing low job quality employment, which may result in higher presenteeism in case of job insecurity and long working hours. Given these results, policy makers should develop strategies to re-establish the indefinite contractual employment with regular working arrangements as the standard and to avoid the use of precarious, insecure contracts or regulations with long working hours. Further, enough attention should be given to these workers in low quality jobs, by specifically taking countermeasures to assure that ill workers in situation of low quality employment are not forced into presenteeism. Further research should be conducted in a longitudinal design, with more accurate and precise definitions of the low employment quality indicator. Objective measurement of sickness absence and presenteeism figures is recommended in order to get more insight into this complex attendance behavior.

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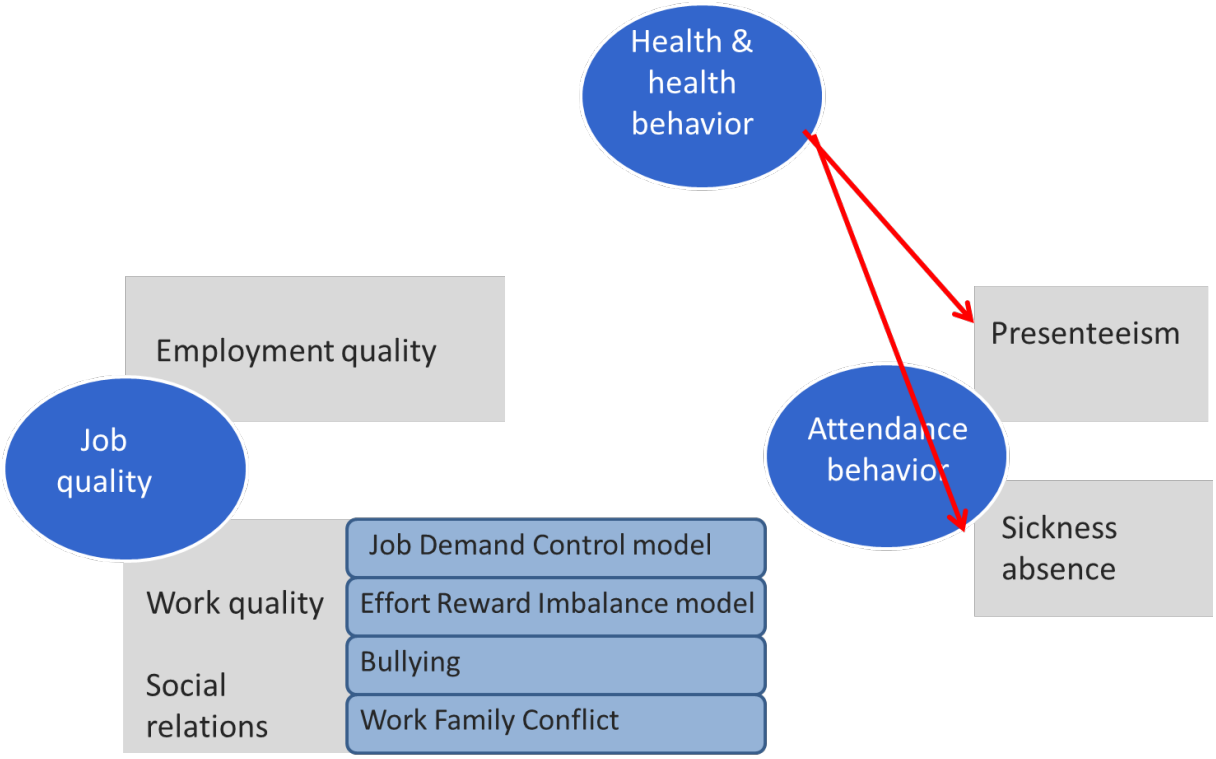
# Chapter 7.
# Relation between Body Mass Index and attendance behavior




Based on:

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# ABSTRACT

**Objective:**
To examine the relationship between Body Mass Index (BMI) class, presenteeism and prospective registered sickness absence.

**Methods:**
Data were collected from 2983 Belgian workers. Presenteeism was assessed by a single question, evaluating the frequency of being at work, despite illness, during the preceding year. Sickness absence data were registered during 12 months follow-up. Multiple logistic regression analysis was conducted.

**Results:**
BMI class was positively and significantly associated with presenteeism (at least 2 occasions of working despite illness) in the male employees and was a significant predictor of high sickness absence (at least 10 sick leave days) in the female population. A final multivariate model demonstrated that these relations were only partly mediated by self-rated health.

**Conclusion:**
The results of this study suggest a gender difference concerning absenteeism and presenteeism in overweight and obese employees.

## 7.1. Introduction

The obesity epidemic has become a major concern in Western societies because obesity and overweight are associated with higher mortality and morbidity rates. The mortality risk in overweight subjects increased by 20% to 40% after 10 years of follow-up and by two- or threefold in obese, compared with normal-weight subjects [1]. A range of chronic diseases are associated with obesity: hypertension, type 2 diabetes mellitus, cardiovascular disease, pulmonary disease, and cancer [2]. Beside these chronic illnesses, several authors demonstrated an association between obesity and depression, anxiety, stress and psychological problems [3, 4]. Due to the increased rates of morbidity and mortality, overweight and obesity are associated with substantial direct health costs for society [5]. But also in the workplace, overweight and obesity can cause high costs for the employers, due to absence and underperformance [6]. Hence, it is not surprising that the impact of overweight and obesity on absenteeism is a subject of investigation. Absenteeism is defined as the time absent from work, due to illness. The association between overweight, obesity and absenteeism is well described. A review revealed strong evidence for the positive relationship between obesity and long-term sick leave. For overweight, the evidence was not conclusive, but the trend is that overweight is a predictor for sick leave as well [7].

In contrast to absenteeism, presenteeism is an often neglected subject. Presenteeism is the phenomenon when an employee decides to go working despite feeling so ill that he or she judges that sick leave would have been appropriate. It has been suggested that the monetary impact of presenteeism even exceeds that of absenteeism [6]. However, the relationship between overweight, obesity and presenteeism is less frequently studied and the results are rather mixed. Several authors concluded that obese employees reported higher presenteeism rates. This effect of weight appeared to have a threshold effect in some of the studies: moderate or extreme obese workers showed the greatest health related work limitations, while their overweight colleagues reported no or less productivity problems while on the job [8-10]. These findings were inconsistent with other studies that were not able to reveal any association between BMI class and presenteeism [11]. An additional reason to pay sufficient attention to the aspect of presenteeism is the finding that presenteeism is a risk factor for a future decline in health. In this way the decision of the worker to go working despite illness, can be harmful for the individual health of the employee [12]. Presenteeism may therefore also lead to sickness absence at a later stage [13, 14].

The primary goal of this study was to explore the relationship between overweight, obesity and presenteeism and to examine the predictive character of overweight and obesity regarding absenteeism, within the Belstress III study [15]. Given the fact that absenteeism and presenteeism are a part of the same decision making process of an ill worker, it is valuable to investigate both issues within the same cohort [16]. Furthermore, this study gives the opportunity to make adjustments for several possible known confounding variables, such as demographic factors, health behaviors, psychosocial work environment variables and measures related to the perceived role conflict between work and family life. Since it is demonstrated that presenteeism, absenteeism and BMI class are associated with the self-rated health status of the employee [17-19], an additional goal was to investigate to what extent the relationship between overweight, obesity and presenteeism/absenteeism can be attributed to health status.

## 7.2. Methods and procedures

### 7.2.1. Study population

The relationship between overweight, obesity, sick leave and presenteeism was examined within the Belstress III study. This prospective study was conducted in seven companies or public administrations across Belgium in 2004 with the objective of identifying risk factors for sick leave from work. All workers aged 30 to 55 years within the participating companies received a personal letter to invite them to volunteer. A total of 2983 workers joined in the study, resulting in a response rate of 30.4%.
The Belstress III study was approved by the ethics committees of the University of Ghent and the Faculty of Medicine of the Free University of Brussels.

### 7.2.2. Data collection

**a) Questionnaire Data**

All participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and characteristics of the psychosocial work environment.
Body Mass Index (BMI) was calculated as the self-reported weight divided by the squared self-reported height (kg/m²). According to the International Classification of the World Health Organization, a BMI between 25 kg/m² and 29.9 kg/m² is defined as overweight, a BMI ≥ 30 kg/m² is considered obesity, while normal weight persons have a corresponding BMI between 18.5 kg/m² and 24.9 kg/m² [20].
The measure of presenteeism was based on a single question that assessed how often employees came to work despite being ill during the last year. There were 4 possible response categories: ‘ never’, ‘one time’, ‘ 2 to 5 times’, ‘ more than 5 times’. We considered persons who reported that they came to work despite being ill at least 2 times during the past year as showing presenteeism.
Several individual and socio-demographic variables were asked, including age, occupation and educational level. Low educational level was defined as primary school and the first 3 years of secondary school level (≤ 9 years of education), medium education as secondary school level (12 years of education) and high education as high school or university ( > 12 years of education). Occupations were defined according to the International Standard Classification of Occupations and grouped into executives, white collars and blue collars [21].
Respondents were asked about a number of health indicators and behaviors, such as current smoking habits (yes/no), alcohol use (average number of units per day) and physical activity. Excessive alcohol consumption was defined as an average of more than 3 units per day for men and more than 2 units per day for women. Physically active persons were considered to sport or to do strenuous physical activity for at least 20 minutes, at least two times a week. Self-rated health was evaluated by the following question: ‘ How do you generally assess your health?’, with 5 response categories. The variable was dichotomized: very good or good versus average, bad or very bad.
To assess the work-related psychosocial factors, the Job Content Questionnaire, based on Karasek’s Job Demand-Control-Support model, was used [22]. Job demands were composed of the sum score of

five items that relate to mental work load, organization constraints on task completion and conflicting demands. Job control was composed of the sum score of two subscales: ‘ skill discretion’ or the level of skill and creativity required on the job and ‘ decision authority’ or the possibilities for workers to make decisions about their work. The third dimension of social support at the workplace also consisted of the sum score of two subscales: ‘ supervisor support’ and ‘ coworker support’. Dichotomous variables were created for demands, support and control, based on the median values. To assess the work- family conflict, two measures based on the questionnaire developed by Kelloway et al. were used [23]. Both work-home interference (WHI), or the amount that work interferes with the responsibilities at home and home-work interference (HWI), or the amount that the private life interferes with work were measured. The two scales ( scores ranging between 6 and 30) were entered in the models as continuous variables [15].

**b) Sickness Absence data**

The objective sickness absence data were collected prospectively during 12 months follow-up, starting from the day on which the questionnaire was filled out. The registered data were obtained from the personnel administration departments of the participating companies. In Belgium a medical certification for absences of more than one day is required to benefit from guaranteed salary and medical insurance. In this way, we expected that the sickness absence registration is highly accurate. Complete sickness absence data, including the single day absences, could be gathered for 2876 participants; 107 were lost during follow-up. This drop out was mainly due to resignation or dismissal, and not attributable to health- related reasons. The upper tertile of the distribution of the total annual sickness days was used as cut-off to classify the workers with a high sickness absence. Thus, persons who were at least 10 days absent in the registered period, were classified as having high sickness absence.

### 7.2.3. Statistical analysis

Chi² tests or t-tests were conducted to assess the gender difference in socio-demographic variables, BMI classes, sickness absence and presenteeism. The relation between BMI class, presenteeism and high sickness absence, was examined using logistic regression analysis. The odds ratios were calculated for overweight and obese persons in comparison with normal weight colleagues as reference class (crude model). In a further step, adjustments were made for age, educational level, profession, smoking habits, alcohol use and physical activity in a multivariate model (model 1). All these variables are risk factors for both sickness absence and presenteeism. In model 2, the relationship was adjusted for possible confounding by psychosocial factors from the work environment and by the two directions of the work-family conflict. So, additional adjustments were made in this multivariate model for job demands, job control and social support at work and for both WHI and HWI. In a final step (model 3), we tested whether the relation between BMI class and absenteeism/presenteeism was to some extent mediated by the health status of the employee. For this purpose, the dichotomous variable self-rated health was used as a control variable in the final multivariate model. In addition, these possible mediation effects were examined following a more stringent approach, outlined by Baron and Kenny [24]. The logistic regression analyses were conducted separately for men and women, since a significant gender difference could be demonstrated for BMI class, absenteeism and presenteeism. Models were screened for multicollinearity between independent

variables according to the calculation of Variance Inflaction Factors. No problems of collinearity were identified in the multivariate models.
All multivariate models were evaluated at 95% significance level ($p < 0.05$). The analyses were conducted using PASW 18.0 software.

## 7.3. Results

A total of 2983 workers joined in the study. The study population consisted of 1372 men (46%) and 1611 women (54%) who were employed within three (semi-)public administrations (53% of the sample), three companies from the service sector (health care or social work) (39% of the sample) and one manufacturing company (8% of the sample). The majority of the participants (72%) worked full-time.

Description of socio-demographic variables, health-behaviors, self-rated health, BMI class, incidence of sickness absence and prevalence of presenteeism in the study population is presented in table 7.1. There were some missing values for several items.

After excluding 45 underweight (BMI<18.5 kg/m²) persons, analyses were conducted on 2938 employees. Mean age was 43. 4 (+/- 6.7) years. Only one fifth of the sample was in the lowest education category.
In the male sample, 45% and 11% of the participants were respectively overweight and obese. Within the female population, 25% overweight and 13% obese workers were observed. High sickness absence (at least 10 days of sickness leave) was registered in 33% of the study sample. Presenteeism (at least 2 times of working despite being ill during the last year) was reported by 51%. Overall, sickness absence and presenteeism rates were higher in the female study population.
The crude model of the logistic regression analysis demonstrated that overweight men had an odds ratio of 1.39 and obese men were 1.58 times more likely to show presenteeism. In women however, this association was not significant (table 7.2).

| Variables | Total sample ( n= 2938) | Men (n=1368) | Women (n=1570) | *p*,gender difference[a] |
|---|---|---|---|---|
| **Mean age: years ( SD)** | 43. 4 (6.7) | 43.6 (6.7) | 43.2 (6.8) | 0.15 |
| **Educational level: % (n)** | | | | |
| Low | 20.8 (610) | 25.9 (353) | 16.4 (257) | |
| Medium | 34.8 (1018) | 34.2 (466) | 35.3 (552) | <0.001 |
| High | 44.4 (1298) | 39.9 (544) | 48.2 (754) | |
| **Occupation: % (n)** | | | | |
| Executive | 24.4 (714) | 33.3 (437) | 18.5 (277) | |
| White collar | 63.8 (1789) | 51.6 (676) | 70.9 (1113) | <0.001 |
| Blue collar | 10.8 (303) | 15.1 (198) | 7.0 (105) | |
| **Smoking: % (n)** | 27.3 ( 796) | 27.8 (379) | 26.8 (417) | 0.55 |
| **High physical activity: % (n)** | 31.8 ( 933) | 41.2 (559) | 24.3 (374) | <0.001 |
| **Excessive alcohol consumption: % (n)** | 21.1 ( 611) | 24.6 (332) | 18.1 (279) | <0.001 |
| **Mean BMI: kg/m² (SD)** | 25.3 (4.0) | 25.9 (3.5) | 24.7 (4.4) | <0.001 |
| **BMI classes: % (n)** | | | | |
| Normal weight (18.5-24.9) | 53.8 (1546) | 43.7 (592) | 62.7 (954) | |
| Overweight: ( 25-29.9) | 34.5 (991) | 45.5 (616) | 24.7 (375) | <0.001 |
| Obesity: ( ≥30) | 11.8 (338) | 10.8 (146) | 12.6 (192) | |
| **Self rated health: % (n)** | | | | |
| Good/very good | 67.9 (1964) | 70.4 (951) | 65.7 (1013) | <0.01 |
| Average/bad/very bad | 32.1 (929) | 29.6 (400) | 34.3 (529) | |
| **High sickness absence: % (n)[b]** | 32.7 (926) | 28.8 (377) | 36.1 (549) | <0.001 |
| **Presenteeism: % (n)** | 50.6 (1463) | 45.2 ( 612) | 55.4 (851) | <0.001 |

[a] results of t-test or chi square test
[b] n= 2831 employees with complete sickness absence data at follow-up

**Table 7.1.:** Description of socio-demographics, Body Mass Index ( BMI), sickness absence and presenteeism.

| | | Presenteeism | | | |
|---|---|---|---|---|---|
| | | Men | | Women | |
| | | OR | 95% CI | OR | 95% CI |
| **Crude model** | Overweight[a] | 1.39** | 1.11-1.75 | 1.21 | 0.95-1.54 |
| | Obesity[a] | 1.58* | 1.09-2.27 | 1.30 | 0.94-1.78 |
| **Model 1[b]** | Overweight[a] | 1.45** | 1.14-1.85 | 1.18 | 0.91-1.53 |
| | Obesity[a] | 1.57* | 1.06-2.31 | 1.29 | 0.92-1.81 |
| **Model 2[c]** | Overweight[a] | 1.59** | 1.23-2.06 | 1.18 | 0.90-1.55 |
| | Obesity[a] | 1.50 | 0.99-2.26 | 1.67 | 0.82-1.66 |
| **Model 3[d]** | Overweight[a] | 1.52** | 1.17-1.98 | 1.13 | 0.86-1.49 |
| | Obesity [a] | 1.31 | 0.86-1.99 | 0.95 | 0.66-1.37 |

* $p<0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] reference category is normal weight

[b] adjusted for age, education level, smoking habits, physical activity, alcohol consumption and profession

[c] adjusted additionally for job demands, job control, social support at work, work-home and home-work interference

[d] adjusted additionally for self-rated health

**Table 7.2.:** Association between overweight, obesity and prevalence of presenteeism using logistic regression analysis (n=2938)

In contrast with this finding, overweight and obesity were significant predictors of high sickness absence only in women. In the male subjects, this relationship could only be confirmed for the obese group (table 7.3.).

In the first multivariate model, adjustments were made for socio-demographic factors (age, occupation and educational level) and lifestyle-related health risk factors (smoking, alcohol consumption, physical activity). Concerning the relation between BMI class and high sickness absence, the results for women remained strongly significant, while the significant association between obesity and high sickness absence in men disappeared after adjustment in model 1. The positive association between BMI class and reported presenteeism stayed at the same significance levels in the male population after adjustment. In general the association between BMI class and presenteeism was somewhat stronger for overweight men than for obese men.

In a further step, additional adjustments were made for perceived job demands, job control, social support at work and both WHI and HWI (model 2). These adjustments changed the relationship between BMI class and high sickness absence only marginally. In the male group, however, obesity was about 1.5 times more associated with presenteeism, but the relationship didn't reach significance anymore at 0.05 level. The positive association between overweight and presenteeism remained strongly significant.

In the final multivariate model, the possible mediating effect of self-rated health on the relation between BMI class and presenteeism/sickness absence was explored. The full model demonstrated that the association between BMI class and high sickness absence in women was partly mediated by self-rated health, but the positive association remained significant (table 7.3). Concerning presenteeism, the model showed that the association between BMI class and presenteeism was only slightly changed. (table 7.2). This mediation effect of self-rated health was confirmed in further mediation analysis (data not shown) [24].

| | | High sickness absence | | | |
|---|---|---|---|---|---|
| | | Men | | Women | |
| | | OR | 95% CI | OR | 95% CI |
| **Crude model** | Overweight[a] | 1.26 | 0.97-1.63 | 1.87*** | 1.46-2.40 |
| | Obesity[a] | 1.71** | 1.16-2.53 | 1.84*** | 1.33-2.54 |
| **Model 1[b]** | Overweight[a] | 1.10 | 0.83-1.46 | 1.75*** | 1.33-2.30 |
| | Obesity[a] | 1.33 | 0.87-2.03 | 1.71** | 1.20-2.42 |
| **Model 2[c]** | Overweight[a] | 1.14 | 0.85-1.53 | 1.67*** | 1.26-2.20 |
| | Obesity[a] | 1.38 | 0.89-2.15 | 1.79** | 1.25-2.56 |
| **Model 3[d]** | Overweight[a] | 1.08 | 0.80-1.45 | 1.58** | 1.19-2.09 |
| | Obesity [a] | 1.18 | 0.75-1.85 | 1.50 * | 1.04-2.17 |

* $p<0.05$; ** $p < 0.01$; *** $p < 0.001$

[a] reference category is normal weight

[b] adjusted for age, education level, smoking habits, physical activity, alcohol consumption and profession

[c] adjusted additionally for job demands, job control, social support at work, work-home and home-work interference

[d] adjusted additionally for self-rated health

**Table7.3.:** Association between overweight, obesity and incidence of high sickness absence using logistic regression analysis (n=2831)

## 7.4. Discussion

We investigated the relation between BMI class and self-reported presenteeism and prospective registered sickness absence data in 2983 Belgian middle-aged workers.

In the literature the association between overweight/obesity and absenteeism is well studied: although several definitions of 'sickness absence' are used, it is demonstrated that obesity is a predictor of long-term sickness absence [7, 25, 26]. Within the Belstress III cohort study, the association of both overweight

and obesity with high sickness absence was positively and significantly demonstrated among women in a middle-aged working population, but not in the male workers. Even after adjusting for several possible confounding factors (health behavior, age, profession, educational level, perceived job demands, control, support and both WHI and HWI) the relationship remained significant. The overweight and obese women were respectively 1.67 and 1.79 times more likely to be absent for at least 10 days in comparison with their normal weight female colleagues.

These findings are to some extent in line with the results of a 4 year prospective cohort study, conducted in 1284 employees of 34 companies in the Netherlands: obese and overweight employees had more sick days per year than normal weight employees; however for the overweight group the difference did not reach significance. The authors did not mention if a substantial gender difference was observed [25]. In contrast with our results, the Whitehall II longitudinal study, conducted in a population of 2564 female and 5853 male British civil servants, described that overweight and obesity were significant predictors for long and short absence, in both men and women [26]. The findings in literature concerning a gender difference are rather limited and inconsistent. As mentioned above, most studies did not indicate whether a possible effect of gender on the association was investigated. However, another Belgian cross-sectional study found a more apparent association between BMI class and sick leave data in women than in men [27]. In contrast with this research and our findings, the results of a study conducted in the London Underground staff showed no evidence for any interaction by gender in the relation between obesity and sick leave [28]. It should be noted that direct comparisons are very complicated due to the large heterogeneity between the studies. Important differences can be noted with regard to the definition of sick leave, since some authors considered only longer sick leaves, while others investigated the total amount of sick leave or took also shorter periods of sickness absence into account. Second, also the assessment of the outcome can differ, as some used self–reported, recalled absence data, while others assessed sickness absence by means of objective registered data. Finally, the follow-up periods in the longitudinal studies diverged from 1 to 7 years, which could also have affected the results.

Less clear is the relation between overweight, obesity and presenteeism. Some studies demonstrated a positive relationship between BMI class and presenteeism, while others reported no association. In our study, overweight and obesity were positively and significantly associated with self-reported presenteeism of at least two times during the preceding year, only in the male population. In a first step the relationship was adjusted for possible health related factors and behaviors, known to be associated with lost productivity while on the job [11, 29]. In the second model, additional adjustments were made for psychosocial work environment factors, since work-related factors seem to be slightly more important than personal circumstances or attitudes in determining someone's ' decision' to go ill to work [30]. A recent study of Johns demonstrated that presenteeism was more common among those who experienced more work to family conflict. Consequently, also WHI and HWI were used as covariates [31]. After these adjustments, the probability for presenteeism in the overweight and obese male workers was respectively 1.59 and 1.50, in comparison with the normal weight group. Although the association in the overweight group remained strongly significant, only a borderline significant relationship was reached in the obese group ($p=0.051$). In contrast with the findings of several studies, demonstrating presenteeism in more extreme obese workers and not in overweight or mild obese workers, we could therefore not confirm this threshold effect in our male population [8-10]. Only a study of Bernaards, performed in a population of white collars with upper limb and neck complaints, revealed an interaction between gender and obesity with respect to presenteeism [32]. In contrast with our results, suggesting a positive association between BMI class and presenteeism only in the male

population, another study investigating the health risks for presenteeism, did not provide support for this relationship in their study population of 2264 men and women [33].
There are several possible explanations for these inconsistent results in the presenteeism literature. First, there is no generally accepted best method for measuring presenteeism: a variety of questionnaires is used to examine this subject. Also the chosen reference period varies: it ranges from 1 week to 1 year, which obviously influences the prevalence of presenteeism. In earlier studies, the percentage of subjects who experienced presenteeism fluctuated from 26.3% when using the last 7 days [33] to 88% when using ' ever' time frames [34]. Another possible reason for these conflicting results is the diversity of study populations: in most of the surveys predominantly white collar study samples were enrolled, whereas other authors conducted their research in manufacturing companies [8-10, 32, 35]. Finally a possible gender effect may play a part in the conflicting results of the previous research, since the studies did not mention whether the interaction between BMI class and gender was investigated.

In the final model, the mediating effect of poor self-rated health on the relationship between BMI class and sickness absence was examined. It is well demonstrated that overweight and obese individuals experience increased morbidity associated with hypertension, type 2 diabetes, coronary heart problems, respiratory problems and osteoarthritis [2]. Hence, workers who are overweight or obese generally classify their own health as average or less than average [19]. As expected, a part of the relationship between BMI class and sickness absence was mediated by the health status of the employee, measured by self-rated health. A part of the higher absence rates of obese and overweight women may be explained by their poor self-rated health; although the adjusted relationship remained significant. Concerning the relationship between BMI class and presenteeism in the male population, the possibility of a mediating effect of health was investigated in an analogous way. The similar mediating effect of self-rated health on presenteeism in obese as well as in overweight men was observed and confirmed by the additional mediation analyses.

Our study offers an important contribution to the existing literature on obesity and overweight since only a few cross-sectionally designed, studies examined the association with both self-reported absenteeism and presenteeism in the same cohort. To our knowledge, this is the first study that investigates presenteeism data in combination with objective sickness absence data, registered in a prospective approach. The results suggest that the problem of overweight and obesity has different consequences for the professional productivity of men and women. Overweight and obese men were more prone to go working despite being ill, whereas women with overweight and obesity were more at risk for augmented sickness absence. However, both behaviors imply a loss of productivity with severe economic consequences for the employer. Furthermore, previous research has shown that presenteeism is a risk factor for future sick leave; this finding was also confirmed in our study (data not shown). A possible source for the observed gender difference is, that there could be a delayed effect in men with regard to sickness absence. Data collected during a longer follow-up period might demonstrate higher rates of sickness absence among overweight and obese men.

A major limitation of this study is the cross-sectional design for exploring the association between BMI class and presenteeism, which does not permit to draw conclusions with respect to causality. A second restriction is the use of self-reported presenteeism assessed with a single question. To assess presenteeism, several questionnaires are available; but in general the validity of these presenteeism measures is difficult to establish, given the nature of the data being collected. Since a decline in productivity is one of the possible consequences of presenteeism, theoretically this productivity loss can be an objective measurement of presenteeism. However for most jobs, especially for knowledge-

based jobs, there is no true account for assessing the workers' productivity. Nevertheless, this single question is applied by several former researchers and revealed similar presenteeism rates ( 38-61%) [13, 36-38].

The fairly low response rate is another restriction. The response rate was lower in the lower occupational groups. Analysis of the non-respondent characteristics revealed no difference with respect to gender or age. Unfortunately, we were not able to examine whether non-respondents differed from respondents with respect to sickness absence levels, presenteeism or weight. In this manner, it is possible that a healthy responder bias plays a role in the observed associations. Another point of discussion is that height and weight were not measured objectively, but based on self-reported assessments. Most research demonstrated that BMI based on self-reported data was lower than BMI based on objective measurements, because of underreporting weight and overreporting height [39]. Therefore, the use of standardized cut-points creates a potential risk for underestimating the prevalence of overweight and obese workers, which consequently leads to rather conservative estimates of the truly existing relationships between BMI and presenteeism/absenteeism.

A major strength of this study is that results were based on registered, objective sickness absence measurements, which is clearly a more reliable evaluation in comparison with self-reported sickness absence. In addition, the longitudinal design of this 12 month follow-up study permitted us to assess the prospective association between BMI class and sickness absence. In addition, the combination of self-reported presenteeism and objective, registered absenteeism on the same cohort, is one of the strong points.

In conclusion, overweight and obesity mean a productivity loss for the employer, since overweight and obese women were more likely to be absent and overweight men reported more presenteeism than their normal weight colleagues.
These findings stress the importance of health promotion at the workplace, more specifically programs that promote healthy weight maintenance. Healthy lifestyles are likely to result in lower absenteeism and presenteeism, leading to socio-economic benefits for companies as well as the whole society.

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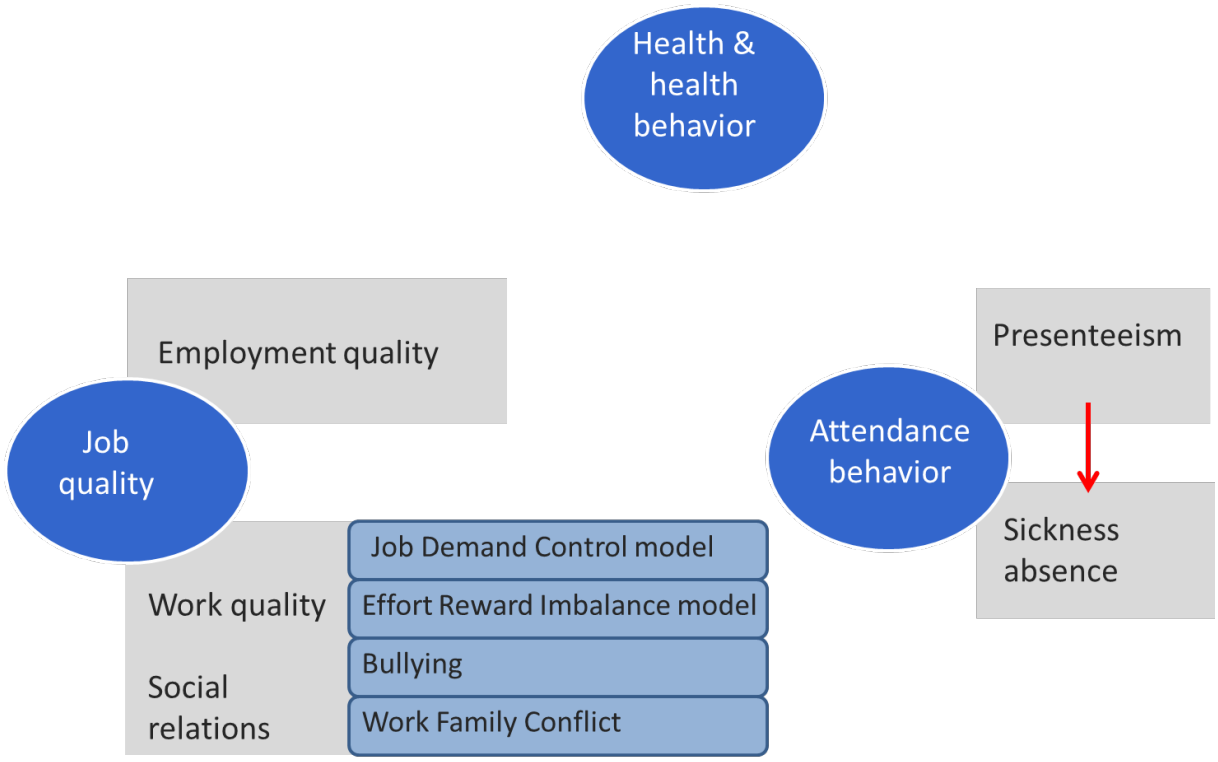
# Chapter 8.
# Prospective relation between presenteeism and several measures of sickness absence




Based on:

Janssens H, Clays E, De Clercq B, De Bacquer D, Braeckman L. The relation between presenteeism and different types of future sickness absence. Journal of Occupational Health, 2013, 55: 132-141.

# ABSTRACT


## Objectives:

The aim of this study was to examine the relation between sickness presenteeism and different types of future sickness absence in 2983 Belgian middle-aged workers.

## Methods:

Data were collected from 1372 male and 1611 female workers. Presenteeism was assessed by a single question, evaluating the frequency of occasions of going at work, despite illness, during the preceding year. Prospective, registered sickness absence data were collected during 12 months follow-up.
Multivariate logistic regression models were used to investigate the relationship between presenteeism and short/ long spells of absenteeism and high sickness absence frequency.

## Results:

High rates (> 5 times) of presenteeism at baseline were significantly and independently associated with both long spells of sickness absence (at least 15 consecutive sick leave days) (men, OR=2.73; 95% CI=1.24-6.03; women, OR=2.40; 95% CI=1.31-4.40) and short spells of sickness absence (sick leave between 1 and 3 days) (men, OR=2.38; 95% CI=1.25-4.51; women, OR=1.90; 95% CI=1.17-3.11) in both genders, during one year follow-up. Moderate rates (2-5 times) of presenteeism were significantly associated with long spells of sickness absence only in the male group (OR=1.90; 95% CI=1.21- 2.97).
With regard to high sickness frequency (at least 3 sick leave episodes), only in the female workers a significant and positive association with high rates of presenteeism was demonstrated (OR= 2.38; 95% CI=1.40-4.04) .

## Conclusions:

These results suggest that presenteeism was related with different types of future sickness absence

## 8.1. Introduction

Recently, sickness presenteeism is gaining growing attention from several researchers. Sickness presenteeism refers to the phenomenon in which an employee goes to work despite feeling so ill that sick leave would have been appropriate [1]. The prevalence of presenteeism varied from 27% to 88% in several studies, depending on the type of questionnaire. In spite of this broad range of prevalence figures, it can be concluded that presenteeism is rather common among employees [2-4].
Research has mainly put emphasis on work-related determinants and personal factors increasing the risk for presenteeism. Work-related factors associated with higher rates of presenteeism are low replaceability [2], lack of work resources, time pressure [5, 6], job stress and – insecurity [7] and mismatch between desired and actual working hours [8]. When focusing on the individual determinants, several factors have been investigated. It is apparent that having a health problem is one of the individual factors that increases the risk for presenteeism [2, 9, 10]. Health conditions such as arthritis, allergies, fatigue and depressive symptoms, overweight and obesity have been associated with higher presenteeism [10, 11]. Additionally, overcommitment, financial problems, lower educational level and younger age are also individual determinants for presenteeism [2, 12].
The economic consequences of presenteeism have been a subject of investigation as well. Presenteeism implies that the worker can not reach his full capacity and thus implicates a productivity loss for the employer. Several researchers tried to estimate the costs of presenteeism and some have suggested that these even exceed the costs associated with sickness absence [13, 14]. Besides the expenditures for the employer, the consequences of presenteeism for the individual worker have been studied. Since sickness presenteeism inhibits the recuperation from illness, it possibly harms the health of the employee. Kivimäki et al. revealed that the incidence of coronary heart disease was twice as high in the group of unhealthy workers that never took sickness absence in comparison with the unhealthy employees with moderate levels of sickness absence [15]. A follow-up study demonstrated that sickness presenteeism seems to be an independent risk factor for future poor general health [16].
Only a few studies have investigated the association between presenteeism and sickness absence. Aronsson et al. demonstrated in a cross-sectional study of 3891 Swedish employees an association between high presenteeism and high sickness absence [2]. These findings were supported by Hansen et al., who revealed a strong correlation between presenteeism and self-reported sickness absence frequency [12]. A recent study of Bergström et al. with several enhanced methodological features in comparison with the former studies, revealed that sickness presenteeism on more than five times during the baseline year, was a significant risk for future sick leave of more than 30 days during the follow-up period [17]. However this study only evaluated the total amount of sickness absence, ignoring the duration of sick leave per spell or the frequency of the sickness spells. Previous findings suggested that differences between sickness absence duration and sickness absence frequency reflect variations in the underlying processes. Short term sickness absence and high absence frequency are assumed to be more related to attitude, while long term sickness absence is suggested to be particularly related to ill health and inability to perform work tasks [18, 19].
The goal of this longitudinal study was to investigate whether there is a relation between sickness presenteeism and different measures of sickness absence among a group of Belgian workers. Presenteeism was examined in relation to both short and long spells of sickness absence and to high frequent sickness absence, during one year follow-up.

## 8.2. Subject and methods

### 8.2.1. Study population

The relation of presenteeism with different measures of future sickness absence was investigated within the Belstress III study, a Belgian follow-up study aiming to identify the risk factors for sick leave at work [20].
The workers, aged 30 to 55 years, from seven Belgian companies ( comprising public administration, health care and social work sector and a manufacturing company) were invited to participate in the study. The response rate was 30.4%, representing a total of 2983 participants and was lower in the lower occupational groups. Analysis of the non-respondent characteristics revealed no difference with respect to gender or age. The study population consisted of 1372 men and 1611 women and the majority (72%) was employed full-time.
The Belstress III study was approved by the ethics committees of the University Hospital of Ghent and the Faculty of Medicine of the Free University of Brussels.

### 7.2.2. Data collection

#### a) Questionnaire Data

All participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and characteristics of the psychosocial work environment.
The measure of presenteeism was based on a single question assessing how often employees came working despite being ill during the last year. There were 4 response categories: ‘ never’, ‘one time’, ‘ 2 to 5 times’, ‘ more than 5 times’, which referred to frequency of occasions of presenteeism. This question has been applied in earlier research on presenteeism [2, 5, 16, 17]. In the analyses, three categories were used: 0-1 times, 2-5 times ( moderate rates of presenteeism), > 5 times ( high rates of presenteeism). The respondents were questioned about their sickness absence, both the total number of sick leave days, the total number of sick leave episodes and the episodes of longer sick leave ( > 15 days) within the previous 12 months. This variables were entered as dichotomous variables ( yes/no) in the analyses. Low educational level was defined as primary school and the first 3 years of secondary school level, medium education as secondary school level and high education as high school or university. Occupations were defined according to the International Standard Classification of Occupations [21] and grouped into executives, white collars and blue collars. Age was used as a continuous variable.
Respondents were asked about a number of health indicators and lifestyle behaviors, such as current smoking habits (yes/no), alcohol use and physical activity. Excessive alcohol consumption was defined as an average of more than 3 units per day for men and more than 2 units per day for women. Physically active persons were considered to sport or to do strenuous physical activities during minimal 20 minutes, at least two times a week. Body mass index ( BMI) was calculated as the self-reported body weight ( in kg) divided by the square of the reported height ( in m) and was entered as a

continuous variable in the analyses. Self-rated health was evaluated by the following question: ' How do you generally assess your health?', with 5 response categories. The variable was dichotomized: very good or good versus average, bad or very bad. For the measurement of symptoms of depression, the short Iowa scale of the Center for Epidemiological studies-Depression scale was applied [22]. This scale consists of 11 items and after calculating the sum score ( range: 11-33), a cut-off value higher than 19 was used to identify those with symptoms of depression.
The psychosocial work environment was assessed with the Job Content Questionnaire, based on the Job-Demand-Control (-Support) model of Karasek [23]. Dichotomous variables were created for demands, support and control, based on the median values. To evaluate the amount of stress outside work, a scale based on eight items regarding problems in private life was used [24]. The upper quartile of the sample was considered having high levels of stress outside work. The workers were asked about the flexibility toward the start and ending of their working day. This variable was entered as a dichotomous variable.

**b) Outcome variables: sickness Absence data**

The objective sickness absence data were collected prospectively during 12 months follow-up, starting from the day on which the questionnaire was filled out. All the sick leave days were registered by the personnel administration departments of the participating companies. Since in Belgium a medical certification for absences of more than one day is required to benefit from guaranteed salary and medical insurance, we expected that this sickness absence registration is highly accurate. Complete sickness absence data could be gathered for 2876 participants; 107 were lost during follow-up, mainly due to resignation or dismissal. A long spell of sickness absence was defined as at least 15 consecutive days of sickness absence during the follow-up period, while a short spell of sickness absence was defined as a spell between 1 and 3 days. High sickness absence frequency was defined as a minimum of 3 sick leave episodes during follow-up; this corresponded to the upper quintile of the sample.

## 8.2.3. Statistical analysis

The relation of presenteeism with the different measures of sickness absence was assessed through logistic regression analysis. Presenteeism was entered as a categorical variable in the analysis: the odds ratios for the employees reporting moderate rates and high rates were calculated, with the category of no or one time of presenteeism as reference.
First, chi² and t-tests were performed, in order to explore whether presenteeism and the possible confounding variables were associated with the three outcome variables. Second, covariates whose univariate test had a p-value $< 0.25$ were retained as a potential confounder and entered in the multivariate logistic regression model, to prevent that potentially important variables were rejected [25].
The factors included as covariates were considered to be potential risk factors for sickness absence [26] and could therefore act as confounders of the relation between presenteeism and sickness absence. Finally, a fully adjusted model including all covariates was reduced by backward elimination of non-significant covariates. The resulting models were controlled by re-introducing each of the eliminated covariates one by one and if significant, the covariate was retained in the model. Since the participants

were recruited from 7 different companies with probable diverse policies toward sickness absence, this variable ‘ company’ was regarded as an essential confounder. Since there were some missing values for several variables, both the crude and adjusted models were restricted to those cases with complete data for all variables entered in the fully adjusted models. To check for collinearity, the variance inflation factors were calculated.
As previous research demonstrated a gender difference in sickness absence [26], the analyses were done separately for men and women. In addition, preliminary analysis revealed a significant interaction effect between gender and presenteeism in the relation with long sickness absence. All multivariate models were evaluated at 95% significance level ($p < 0.05$). The analyses were conducted using PASW 18.0 software.

## 8.3. Results

Table 8.1 demonstrates that the majority of the sample was white collar or executive and only 20% of the total study population was lower educated. The percentage of lower educated workers and blue collars was significantly higher in the male group. The proportion of workers with average/bad/very bad self-rated health and with depressive symptoms was significantly higher in women.

Table 8.2 summarizes presenteeism and short/long spells of sickness absence and high sickness frequency in the study population. A significant gender difference could be observed, indicating that the female group had higher sick leave and higher presenteeism figures.
In the crude model, moderate and high rates of presenteeism at baseline were positively and significantly associated with long spells of sickness absence and high sickness frequency during the follow-up period of 1 year, in both males and females. The results suggest a dose response relationship for long spells and high frequent sickness absence (table 8.3 and 8.4). For short spells of sickness absence, a significant association in both gender only could be demonstrated for the high rates of presenteeism (table 8.5).

| Variable | Total study sample (n=2983) | Men (n=1372) | Women (n=1611) | Gender difference, $p^a$ |
|---|---|---|---|---|
| **Socio-demographic variables:** | | | | |
| Age ( years): mean (SD) *(n=2983)* | 43.3 (6.74) | 43.5 ( 6.67) | 43.1 (6.80) | 0.12 |
| Educational level: n (%)[b] *(n=2971)* | | | | |
| Low educated | 617 (20.8) | 353 (25.8) | 264 (16.4) | <0.001 |
| Medium educated | 1031 (34.7) | 467 (34.2) | 564 (35.2) | |
| High educated | 1323 (44.5) | 547 (40.0) | 776 (48.4) | |
| Occupation: n (%)[b] *(n=2850)* | | | | |
| Executive | 719 (25.2) | 439 (33.4) | 280 (18.2) | <0.001 |
| White collar | 1826 (64.1) | 678 (51.5) | 1148 (74.8) | |
| Blue collar | 305 (10.7) | 198 (15.1) | 107 (7.0) | |
| **Lifestyle variables:** | | | | |
| Body Mass Index (kg/m²): mean (SD) *(n=2927)* | 25.1 (4.08) | 25.9 (3.50) | 24.5 (4.43) | <0.001 |
| Smoking: n (%)[b] *(n=2962)* | 816 (27.5) | 380 (27.8) | 436 (27.3) | 0.769 |
| Excessive alcohol use: n (%)[b] *(n=2936)* | 619 (21.1) | 332 (24.5) | 287 (18.2) | <0.001 |
| Low physical activity: n (%)[b] *(n=2943)* | 2002 (68.0) | 802 (58.9) | 1200 (75.9) | <0.001 |
| **Health-related variables:** | | | | |
| Depressive symptoms: n (%)[b] *(n=2948)* | 773 (26.2) | 270 (19.8) | 503 (31.7) | <0.001 |
| Poor self-rated health: n (%)[b] *(n=2938)* | 943 (32.1) | 401 (29.6) | 542 (34.2) | 0.007 |
| **Work- related variables:** | | | | |
| High job demands: n (%)[b] *(n=2959)* | 1506 (50.9) | 635 (46.6) | 871 (54.5) | <0.001 |
| Low job control: n (%)[b] *(n=2955)* | 1475 (49.9) | 596 (43.7) | 879 (55.2) | <0.001 |
| Low social support: n (%)[b] *(n=2945)* | 1510 (51.3) | 706 (51.8) | 804 (50.8) | 0.621 |
| High stress outside work:n(%)[b] *(n=2892)* | 785 (27.1) | 336 (25.0) | 449 (29.0) | 0.018 |
| Flexible working hours: n (%)[b] *(n=2953)* | 968 (32.8) | 547 (40.3) | 421 (26.4) | <0.001 |

[a] result of t test or $X^2$ test

[b] calculated according to the percentage of the valid count

**Table 8.1.:** Descriptive socio-demographic, life style, health and work related variables in the total study population

| Variable | Total study sample (n=2983) | Men (n=1372) | Women (n=1611) | $p^a$,Gender difference |
|---|---|---|---|---|
| **Presenteeism:** n (%)[b] *(n=2933)* | | | | |
| 0-1 time | 1448 (49.4) | 746 (54.9) | 702 (44.6) | <0.001 |
| 2-5 times | 1246 (42.5) | 537 (39.6) | 709 (45.0) | |
| > 5 times | 239 (8.1) | 75 (5.5) | 164 (10.4) | |
| **Long spells (> 15 days) of absence**: n (%)[b] *(n=2876)* | 522 (18.2) | 199 (15.1) | 323 (20.7) | <0.001 |
| **Short spells (1-3 days) of absence**: n (%)[b] *(n=2875)* | 1069 (37.2) | 453 (34.4) | 616 (39.5) | 0.005 |
| **High frequency of sickness absence**: n (%)[b] *(n=2875)* | 568 (19.8) | 231 (17.6) | 337 (21.6) | 0.007 |

[a] result of $X^2$ test
[b] calculated according to the percentage of the valid count

**Table 8.2**.: Presenteeism and absenteeism in the total study population

| | Long spells of absence (> 15 days) | | | |
|---|---|---|---|---|
| | Men (n=935) | | Women (n=867) | |
| | Crude OR (95% CI) | Adjusted OR (95% CI)[a] | Crude OR (95% CI) | Adjusted OR (95% CI)[a] |
| **Baseline presenteeism:** | | | | |
| 0-1 time | 1 | 1 | 1 | 1 |
| 2-5 times | 2.26 (1.50-3.40)*** | 1.90 (1.21-2.97)** | 1.60 (1.10-2.34)* | 1.37 (0.91-2.06) |
| >5 times | 4.81 (2.38-9.72)*** | 2.73 (1.24-6.03)* | 3.67 (2.15-6.28)*** | 2.40 (1.31-4.40)** |
| **Occupation:** | | | | |
| Executives | 1 | 1 | 1 | 1 |
| White collars | 1.63 (1.04-2.57)* | 1.18(0.72-1.96) | 1.95 (1.15-3.30)* | 1.24 (0.71-2.18) |
| Blue collars | 2.92 (1.63-5.22)*** | 2.26 (1.16-4.38)* | 4.66 (2.15-10.10)*** | 3.46 (1.47-8.14)** |
| **Depressive symptoms:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 2.54 (1.67-3.86)*** | 1.54 (0.94-2.52) | 2.05 (1.44-2.92)*** | 1.40 (0.93-2.09) |
| **Sick leave during previous year:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 4.12 (2.77-6.15)*** | 2.59 (1.67-4.01)*** | 1.86 (1.30-2.65)** | 1.53 (1.04-2.25)* |
| **Self-rated health:** | | | | |
| Good/very good | 1 | 1 | 1 | 1 |
| Average/bad/ very bad | 2.84 (1.93-4.18)*** | 1.73 (1.10-2.73)* | 2.41 (1.71-3.41)*** | 1.54 (1.04-2.29)* |
| **Job demands:** | | | | |
| High | 1 | 1 | 1 | 1 |
| Low | 1.25 (0.85-1.83) | 1.20 (0.73-1.72) | 1.39 (0.99-1.95) | 1.60 (1.07-2.38)* |
| **Body mass index:** | | | | |
| | 1.06 (1.00-1.11)* | 1.01 (0.96-1.07) | 1.08 (1.04-1.12)*** | 1.06 (1.02-1.10)** |

***p<0.001,**p<0.01,*p<0.05

[a] odds ratio's are adjusted for the covariates as listed in the table and additionally adjusted for 'company'; 95% CI = 95% confidence interval

**Table 8.3.:** Independent odds ratio's (OR ) for presenteeism and confounding variables for long spells of absence

| | High absence frequency (> 3 occasions) | | | |
|---|---|---|---|---|
| | Men (n=1130) | | Women (n=1251) | |
| | Crude OR (95% CI) | Adjusted OR (95% CI)[a] | Crude OR (95% CI) | Adjusted OR (95% CI)[a] |
| **Baseline presenteeism:** | | | | |
| 0-1 time | 1 | 1 | 1 | 1 |
| 2-5 times | 1.50 (1.07-2.08)* | 1.13 (0.77-1.65) | 1.51 (1.11-2.05)** | 1.22 (0.86-1.72) |
| >5 times | 3.71 (2.07-6.65)*** | 1.70 (0.84-3.44) | 3.21 (2.05-5.01)*** | 2.38 (1.40-4.04)** |
| **Occupation:** | | | | |
| Executives | 1 | 1 | 1 | 1 |
| White collars | 3.17 (2.05-4.90)*** | 2.47 (1.53-4.01)*** | 2.20 (1.40-3.45)*** | 1.73 (1.05-2.83)* |
| Blue collars | 4.57 (2.71-7.73)*** | 2.66 (1.47-4.84)** | 3.78 (1.99-7.17)*** | 2.31 (1.14-4.69)* |
| **Depressive symptoms:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.96 (1.36-2.82)*** | 1.04 (0.66-1.64) | 1.54 (1.15-2.06)** | 1.42 (0.99-2.03) |
| **Sick leave during previous year:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 6.80 (4.77-9.69)*** | 4.99 (3.36-7.40)*** | 3.32 (2.46-4.49)*** | 2.65 (1.90-3.71)*** |
| **Self-rated health:** | | | | |
| Good/very good | 1 | 1 | 1 | 1 |
| Average/bad/ very bad | 2.89 (2.09-3.99)*** | 2.07 (1.39-3.10)*** | 2.46 (1.84-3.27)*** | 1.74 (1.24-2.46)** |
| **Job demands:** | | | | |
| High | 1 | 1 | 1 | 1 |
| Low | 1.30 (0.95-1.79) | 1.02 (0.70-1.50) | 1.63 (1.23-2.16)** | 1.54 (1.10-2.16)* |
| **Social support at work:** | | | | |
| High | 1 | 1 | 1 | 1 |
| Low | 1.65 (1.20-2.28)** | 1.61 (1.11-2.33)* | 1.19 (0.90-1.58) | 1.13 (0.82-1.56) |
| **Body mass index:** | | | | |
| | 1.05 (1.01-1.10)* | 1.00 (0.95-1.05) | 1.05 (1.02-1.09)* | 1.05 (1.02-1.09)** |
| **Physical active:** | | | | |
| Yes | 1 | 1 | 1 | 1 |
| No | 1.31 (0.95-1.82) | 1.14(0.79-1.66) | 0.77 (0.56-1.05) | 0.60 (0.42-0.86)** |

***p<0.001,**p<0.01,*p<0.05

[a] odds ratio's are adjusted for the covariates as listed in the table and additionally adjusted for 'company'; 95% CI = 95% confidence interval

**Table 8.4.:** Independent odds ratio's (OR ) for presenteeism and confounding variables for frequent sickness absence

| | Short spells of absence (1-3 days) | | | |
|---|---|---|---|---|
| | Men (n= 1026) | | Women (n=1044) | |
| | Crude OR (95% CI) | Adjusted OR (95% CI)[a] | Crude OR (95%CI) | Adjusted OR (95% CI)[a] |
| **Baseline presenteeism:** | | | | |
| 0-1 time | 1 | 1 | 1 | 1 |
| 2-5 times | 1.15 (0.88-1.51) | 1.06(0.79-1.42) | 1.05 (0.81-1.37) | 1.06 (0.80-1.41) |
| >5 times | 2.75 (1.53-4.93)** | 2.38 (1.25-4.51)** | 1.71 (1.10-2.65)* | 1.90 (1.17-3.11)* |
| **Occupation:** | | | | |
| Executives | 1 | 1 | 1 | 1 |
| White collars | 1.70 (1.26-2.28)*** | 1.57 (1.13-2.17)** | 0.96 (0.70-1.33) | 0.87 (0.62-1.24) |
| Blue collars | 2.11 (1.39-3.20)*** | 1.60 (1.02-2.50)* | 1.38 (0.78-2.45) | 0.99 (0.53-1.82) |
| **Sick leave during previous year:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.32 ( 0.98-1.77) | 1.42 (1.04-1.94)* | 1.50 (1.13-1.99)** | 1.41 (1.04-1.91)* |
| **Self-rated health:** | | | | |
| Good/very good | 1 | 1 | 1 | 1 |
| Average/bad/ very bad | 1.83 (1.38-2.42)*** | 1.73 (1.26-2.37)** | 1.25 (0.96-1.63) | 1.20 (0.88-1.62) |
| **Job demands:** | | | | |
| High | 1 | 1 | 1 | 1 |
| Low | 1.22 (0.94-1.58) | 1.10 (0.83-1.47) | 1.56 (1.21-2.01)** | 1.38 (1.04-1.84)* |
| **Age:** | | | | |
| | 0.99 (0.97-1.01) | 0.99 (0.97-1.01) | 0.98 (0.96-1.00)* | 0.98 (0.96-1.00)* |
| **Body Mass Index:** | | | | |
| | 1.01 (0.98-1.05) | 1.00 (0.96-1.04) | 1.01 (0.98-1.04) | 1.03 (1.00-1.06) |
| **Smoking:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.50 (1.13-1.99)** | 1.30 (0.96-1.76) | 1.07 (0.80-1.43) | 0.99 (0.73-1.35) |
| **Problems outside work:** | | | | |
| No | 1 | 1 | 1 | 1 |
| Yes | 1.41 (1.05-1.89)* | 1.41 (1.02-1.96)* | 1.05 (0.80-1.39) | 1.17 ( 0.86-1.60) |

***p<0.001,**p<0.01,*p<0.05

[a] odds ratio's are adjusted for the covariates as listed in the table and additionally adjusted for 'company'; 95% CI = 95% confidence interval

**Table 8.5.:** Independent odds ratio's (OR) for baseline presenteeism and confounders for short spells of absence

During the conduction of the statistical analyses, several groupings of confounders that reached the explained criteria, were studied together with presenteeism. The covariate 'company' was considered as an a priori confounder (results for this separate covariate are not shown). The other selected confounders used in the fully adjusted models for the several outcome variables are listed in the tables. After adjustment, the relationship in the female workers, between moderate rates of presenteeism and long spells of sickness absence disappeared. The adjustments did not substantially change the significance of the positive relation between high sickness presenteeism and short sickness absence.

When regarding the high frequency sickness absence outcome, only in the female workers the relationship between high rates of presenteeism and high sickness frequency remained significant. The Nagelkerke $R^2$ values of the models were considerably higher for long sickness absence and high frequent absence in comparison with those for short spells of sickness absence (table 8.6).

| | **Long sickness absence** | | **High frequent absence** | | **Short sickness absence** | |
|---|---|---|---|---|---|---|
| | Men | Women | Men | Women | Men | Women |
| Presenteeism crude model | 0.051 | 0.041 | 0.029 | 0.032 | 0.016 | 0.008 |
| Fully adjusted model | 0.191 | 0.171 | 0.264 | 0.236 | 0.110 | 0.119 |

**Table 8.6.:** Nagelkerke $R^2$ for the crude associations between presenteeism and sickness absence and for the fully adjusted models.

## 8.4. Discussion

This longitudinal study demonstrated that presenteeism is related with several detailed measures of absenteeism in a Belgian working population.
This study adds evidence to the scarcely existing literature, investigating the relation between presenteeism and sickness absence. A few cross-sectional studies supported the finding that high presenteeism is associated with high sickness absence [2, 12]. To our knowledge, only one study has examined the relation between presenteeim and sickness absence duration in a prospective way and concluded that high rates of presenteeism at baseline, were a significant risk for future sick leave. However, this study by Bergström [17] was restricted to the total amount of absence days without considering the length or incidence of the separate periods of absence. Although, since it is suggested that long spells of sickness absence are more related to the health status of the employee, while the working conditions are considered to effect the shorter spells of sickness absence [18], it is important to evaluate the relation of presenteeism with both types of sickness absence. Presenteeism is suggested to cause poor health status. The worker who is attending work despite illness can not take the required recuperation period, which may lead to an exacerbation of illness symptoms and subsequently reduce the capacity to remain at work in the long term [15, 16]. Therefore it is likely that presenteeism would be related with future long spells of sickness absence, which is confirmed by our results. However, high rates of presenteeism were related to short spells of sickness absence in both men and women; and frequent sickness leave in women, as well. Still other aspects, such as the situation of the labour market with economic insecurity, changes in management strategies toward sickness absence, workplace culture, sense of duty of the individual worker can be factors in the complex mutual interplay between absenteeism and presenteeism. These factors were possibly not fully captured by the confounding variables and can also vary during the follow-up period, forcing someone more into presenteeism or sickness absence. The rather low Nagelkerke $R^2$ of the fully adjusted model for the short spells of sickness absence confirms this concern of lacking covariates. In contrast, the $R^2$ of the models for long spells of absence and high frequent sickness absence were considerably higher, which suggests that these models contained important covariates for explaining the outcome.

Another notable finding is that a dose response relationship could be demonstrated: high rates of presenteeism were linked with higher odds for long spells of sickness absence, which provides additive confirmation for the relation of presenteeism with long spells of future sickness absence. With respect to the short spells of sickness absence, only high rates of presenteeism were significantly associated with this sickness absence measure, indicating that a minimum frequency of 5 times of presenteeism at baseline is needed to be related with short spells of sickness absence. Only in female workers, presenteeism on more than 5 times was significantly related to high sickness absence frequency. These results underline the suggestion of Bergström [17], that the frequency of occasions of sickness presenteeism is of substantial importance for the risk of future sickness leave. Besides the frequency, it is possible that also the length of presenteeism may play an important role. Since the applied presenteeism measure did not contain the duration of presenteeism, no information about the impact of the length of presenteeism on sickness absence could be provided.

Since in literature important gender differences were revealed regarding sickness absence, the relation of presenteeism with sickness absence was studied separately for both genders [26]. Moreover, a significant interaction effect between gender and presenteeism with regard to the long spells of sickness absence was observed ( results not shown). Concerning the short spells and high frequent sickness absence, no significant interaction effect between gender and presenteeism could be revealed. This suggestion is in contrast with Bergström's conclusion that his results would be generally applicable to both men and women [17].

Concerning the other covariates, self-rated health status, previous sickness absence and occupation were related to the several measures of absenteeism, which was also demonstrated in previous research [27]. In female workers, body mass index was associated with long spells and frequent sickness absence, which is in line with earlier research highlighting the association between obesity and sick leave [28]. Low social support was not consistently related to the sickness absence measures, which is in accordance with previous findings, indicating that social support was of less importance as a predictor for sickness absence [29]. Only in men, low social support was associated with frequent absences. The same relationship between high levels of support and lesser sickness absence spells was observed only in the male group of the Gazelcohort [30]. High job demands were independently related with a reduced risk for the three sickness absence measures, only in the female group. This is in contrast with some previous studies stating an association of high demands with absenteeism [31, 32]. However, the association of high demands with lower sickness absence figures was also demonstrated in a sample from the Whitehall II cohort [33]. A possible explanation is that a selection of ambitious workers occurred in this predominantly white-collar sample. These individuals possibly consider these high demands jobs as a challenge and are therefore likely to have less sickness absence. Remarkably, job control was not retained in any of the models, which is in contrast with most of the research that identified low job control as an important psychosocial risk factor for sick leave [30].

To the authors' knowledge, this is the first study that investigates the relation of presenteeism with different measures of future sickness absenteeism.

However, there are some limitations that have to be mentioned. First, presenteeism, measured with a single item, could be effected by recall bias. To assess presenteeism, several questionnaires are available; but in general the validity of these presenteeism measures is difficult to establish, given the nature of the data being collected. Since a decline in productivity is one of the possible consequences of presenteeism, theoretically this productivity loss can be an objective measurement of presenteeism. However for most jobs, especially for knowledge-based jobs, there is no true account for assessing the workers' productivity. Nevertheless, this single question is applied by several former researchers and suggested similar presenteeism rates ( 38-61%) [4, 6, 7, 16, 17].

The fairly low response rate is another restriction, which can lead to a selection bias in the population. Unfortunately, we were not able to examine whether non-respondents differed from respondents with

respect to sickness absence levels or presenteeism. Although no important differences in age and gender were revealed, caution should be made in generalization of the results. Another selection bias, can be possibly caused by the drop-out of 107 workers, during the follow-up period. However, analysis of the presenteeism rates showed no significant difference between this group with missing data, and the included workers. In addition, it should be noted that participants of the Belstress III study were not recruited from a representative sample of the Belgian working population. Nevertheless, this is of little value in analytical studies like this one, where possible causal relationships are examined [34].

Since the empirical knowledge and the theoretical insights in the relationship between the concept of presenteeism and sickness absence are limited, the selection of the co-variables that may act as confounders is a challenging task. Although several potential confounders were tested in the models, it is possible that the addition of other variables would result in modified odds ratios. Another limitation is related to the statistical analyses used in this study. In multiple logistic regression analysis, sufficient events per covariate are needed in order to obtain a reliable estimate of the regression coefficients. This may be a problem for high presenteeism, which is a relatively infrequent event in both gender. However, the criterion that at least 10 events per variable should be achieved, was met for all separate covariates [35]. Therefore, the models were adjusted for baseline sickness absence, instead of conducting the analysis on a subgroup of participants without sickness absence at baseline. Nevertheless, additional analysis was conducted on this subgroup, which demonstrated quite similar results, although, for some presenteeism groups, the odds ratios were not or only borderline significant, due to reduced statistical power.

Unfortunately, it was not possible to investigate the impact of presenteeism on diagnosis- specific sickness absence, which possibly could provide more information about the particular effect of presenteeism on the health status of the individual worker. Finally, it is worth mentioning that the follow-up period of one year is rather short, to evaluate the full effect of presenteeism on the sickness absence measurements.

A major strength of this study is that results were based on registered, objective sickness absence measurements, which is clearly a more reliable evaluation in comparison with self-reported sickness absence. Moreover, the accurate registration of sickness absence data enabled us to analyze the association between presenteeism and both long/short spells of sickness absence and sickness frequency. In addition, the longitudinal design of this 12 month follow-up study permitted us to assess the prospective association between presenteeism and sickness absence. Furthermore, the data allowed adjusting for previous sickness absence and other potential confounding variables.

In conclusion, we demonstrated that presenteeism was related with several measures of future sickness absence, especially with long sickness absence. Some recommendations for further research can be made. Longitudinal studies that not only record the incidence and duration of sickness absence, but additionally assess the health status, the diagnosis-specific sickness absence and the presenteeism behavior during a longer follow-up period can allow exploring more profoundly the interplay between presenteeism and absenteeism. The main implication for practice is that management strategies dealing with absenteeism, also have to take into account the concept of presenteeism. Employers have to be aware of the possible consequences of high rates of presenteeism on their absence figures.

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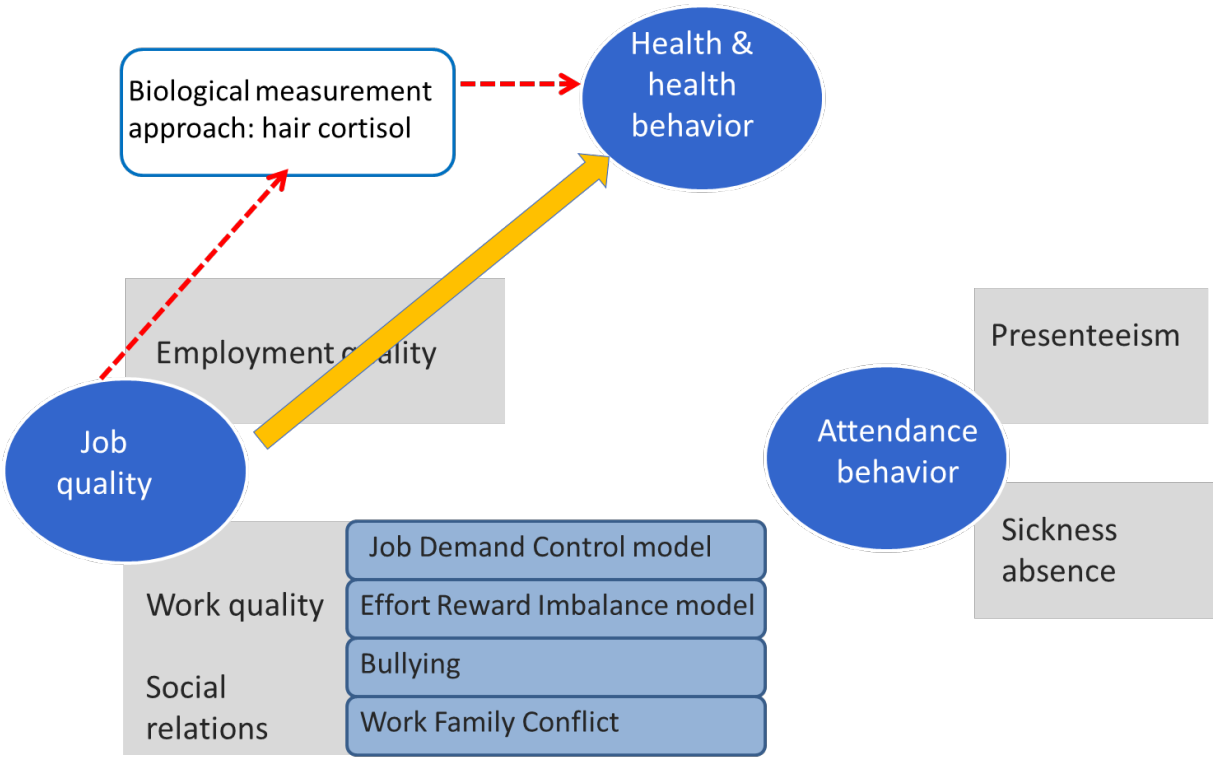
# Chapter 9.

# Is hair cortisol a suitable biomarker for measuring stress related to indicators of work quality?




Based on:

Janssens H, Clays E, Fiers T, Verstraete AG, De Bacquer D, Braeckman L. Hair cortisol concentration in relation to job stress and depressive symptoms in Belgian workers. International Archives of Occupational and Environmental Health, *submitted.*

# ABSTRACT

## Objective:

Measurement of hair cortisol concentration (HCC) is a promising method to be used as a biomarker for chronic stress. However, the association between stress and HCC has rarely been investigated in a working population. Therefore, the present study aims to explore associations between various stress measures and HCC in Belgian workers.

## Methods:

Hair samples were collected from workers in 2 production companies and cortisol content was determined by liquid chromatography tandem mass spectrometry (LC-MS/MS). Participants completed a questionnaire including socio-demographics, health behaviors and standardized measures for assessing stress.

## Results:

After excluding those workers suffering from a psychiatric or neuroendocrine disease and those treated with glucocorticoids, a total of 102 workers were retained with both questionnaire, cortisol results and anthropometric measures. Median HCC was 5.73 pg/mg hair (inter-quartile range=4.52–9.06). No significant associations could be revealed between cortisol and the standardized measures, related to several work psychosocial risk factors. A significantly lower mean HCC was found in shift workers in comparison with day workers, adjusted for age. Additionally, a significant higher mean HCC was demonstrated in workers with symptoms of depression in comparison with those without symptoms of depression, after adjustment for age.

## Conclusions:

HCC showed a limited applicability as a biomarker of job stress in this sample, although the results suggest this method may be a suitable marker for detecting early symptoms of depression. Further research is needed to investigate the applicability of HCC in the working environment and within job stress research.

## 9.1. Introduction

The experience of chronic stress is associated with several adverse health effects, such as cardiovascular, metabolic and mental disorders and changes in the immune response [1]. These negative effects of stress are partly mediated by cortisol, which is the end hormone of the hypothalamic-pituitary-adrenocortical (HPA)-axis. Cortisol is essentially involved in the regulation of a broad range of bodily processes. Therefore, long term changes in the cortisol secretion may have an impact on metabolism and body composition, consequently causing health problems [2, 3].

Until now, cortisol was mainly measured in saliva or serum. However, the use of these matrices requires strict scheduling of sample collection, since cortisol secretion shows a circadian rhythm, with a pulse in the early morning [4] . The cortisol awakening response, assessed with several saliva samples during the morning, is often used as an indicator of HPA-axis activation, and several studies related this measure to psychosocial factors, which revealed inconsistent results [4]. This method, however, was shown to be limited by compliance of the participants, since the moment of the first sample is crucial [5]. Additionally, these single measurements reflect acute alterations of cortisol secretion rather than being an assessment of the long-term cortisol levels. Therefore, the method, developed in 2004 by Raul et al. [6], to measure the concentration of cortisol in hair (HCC) creates opportunities to serve as a biomarker for stress-related conditions in psychobiological research. HCC was examined in stress-related conditions and psychiatric disorders, revealing mixed results [7-15]. Also the relationship between HCC and several questionnaire based stress-measures was explored. One of the most applied instruments is the perceived stress scale (PSS), which is used to measure the degree of distress one is perceiving and the ability to cope with this distress during the last month [16]. This research also resulted in inconsistent findings [8, 17-20], which are commonly explained by the discrepancy in the length of the hair sample and exposure period assessed by the questionnaire, or by recall bias or social desirability bias [21].

Although several authors applied this novel technique of HCC, the studies conducted in a working population are limited. In this research area, Manenschijn et al. [22] examined the association between shift work and HCC, revealing that in workers aged younger than 40 years, shift workers had significantly higher HCC. Further, Qi et al. [23] showed a positive association between effort-reward ratio and HCC in a sample of 39 female kindergarten teachers. Additionally, an inverse correlation between HCC and need for recovery was reported, while no significant associations were found between HCC and job demands or job control [24]. Recently, Steinisch et al. [25] investigated the relation between several psychosocial factors and HCC in a Bangladeshi factory, revealing that only work-related values were positively associated with elevated HCC.

Since research using HCC in a work context is scarce, the present study aims to explore associations of both work related stress measures with HCC in a sample of Belgian workers. We hypothesized that work stress measures are positively associated with HCC, since previous studies suggested a relation between elevated HCC and chronic stress conditions.

## 9.2. Materials and Methods

### 9.2.1. Study population

Participants were recruited from 2 production companies in Belgium. A short explanation about the study and the purposes was provided to each worker in both companies, using the existing internal communication procedures (which mainly consists of e-mail letters and written periodical information brochures). Workers, who gave their informed consent to participate, were given an appointment for hair sample collection and anthropometric measurements. They received a link to an online survey or a paper version of the questionnaire, depending on their preference. A total of 146 workers volunteered in the study, representing 15 % of the workers of the 2 companies. Although a reminder was sent, valid questionnaire data were obtained from only 141 workers (116 used an online survey, the others filled in the printed form) and a total of 132 hair samples were collected.

The following inclusion criteria were used: a) hair weight was more than 10 mg; b) the length of the hair on the posterior vertex was at least 2 cm; c) workers answered negatively on the question if they were currently suffering or had suffered from a psychiatric disease (e.g. depression, bipolar disorder, addiction problems,..); d) participants answered negatively on the question if they were currently suffering from a neuro-endocrine disease with altered cortisol levels in the blood (e.g. Addison's disease or Cushing syndrome, or pituitary diseases); e) participants were not currently treated with glucocorticoids. Application of the criteria of hair length and weight resulted in 124 hair samples suitable for analysis of cortisol. One result was excluded from the statistical analysis since the cortisol concentration was inexplicably high (1606 pg/mg hair). After additionally excluding those workers who did not meet the inclusion criteria with respect to medical conditions and glucocorticoids use, a total of 102 workers were retained with both questionnaire and cortisol results.
This study received approval by the Ethics Committee of Ghent University Hospital.

### 9.2.2. Data collection

**a) Questionnaire**

All participants completed a self-administered questionnaire including standardized measures for individual and socio-demographic variables, health behaviors and both work-related psychosocial stressors.
Work-related psychosocial factors were measured using the job content questionnaire based on the job demand control support model of Karasek [26]. Job demands consisted of five items that evaluate mental work load, organization constraints on task completion and conflicting demands. Job control was composed of two subscales: skill discretion consisted of 6 items referring to the level of skill and creativity required on the job and decision authority was composed of 3 items concerning the possibilities for workers to make decisions about their work. For both dimensions, the sum scores were calculated. The third dimension measured social support at the workplace, which also consisted of the sum score of two subscales, each containing 4 items: supervisor support and coworker support. These questions were scored on a 4-point Likert scale, and sum scores were calculated for the several scales. Besides these scales, founded on a well-established job stress model, some dimensions of a newer instrument to measure the psychosocial work environment were included into the questionnaire

Both emotional demands and cognitive demands were dimensions from the Copenhagen psychosocial questionnaire, which is a questionnaire aiming to cover a broader range of psychosocial risk factors at work [27]. Both emotional and cognitive demands were composed of 4 items, and were scored on a 5-point Likert scale. Additionally, all these psychosocial factors were transformed into categories based on tertiles, for statistical analysis by group.
The survey also contained a question concerning the work schedule and from this a dichotomous variable was created: day work only versus shift work referring to both exclusive night shifts and rotated shifts.

For the measurement of symptoms of depression, the short Iowa scale of the Center for Epidemiological Studies-Depression scale was applied [28]. This scale consists of eleven items, assessing symptoms of depression during the last 2 weeks, of which the sum score was computed. A binary variable was created and those with values ≥19 were defined as reporting symptoms of depression [29].

Several possible confounding factors were assessed such as current smoking habits (yes/no), alcohol use (average number of units per day). Excessive alcohol consumption was defined as an average of more than three units per day for men and more than two units per day for women. The survey also contained a question assessing chronic disease (yes/no).

**b) Anthropometric measures**

Since previous research generally suggested an association between anthropometric measures of adiposity and HCC [21, 22, 30], both waist-hip ratio (WHR) and body mass index (BMI) were included as possible confounding factors. Simultaneous collection of hair samples and anthropometric measures were performed in the workplace of the participants.
Weight, height, hip and waist circumferences were measured with light indoor clothing without shoes by trained researchers. Body mass index was calculated as the weight (in kg) divided by the squared height (in m). Body mass index was categorized in non-obese and obese workers, based on a cut-off value of 30kg/m² [31]. The waist-hip ratio was calculated as the ratio of waist (in cm) over hip (in cm).

**c) Hair sample collection**

Hair samples were cut from the vertex posterior with a scissor as close as possible to the scalp.

### 9.2.3. Hair analysis

15 mg of hair (vertex posterior, 2 à 3 cm closest to scalp) were pulverized in a Retsch Ball mill MM200. After addition of 2mL Sorensen buffer and 20 µL of $D_4$-cortisol internal standard the hair was incubated overnight at 42°C. To 1.8mL of buffer 100 µL NaOH (1M) was added and mixed. After extraction with 2.5 mL of diethylether and mixing for 3 minutes, samples were frozen and decanted with subsequent drying of the collected supernatant; the dried supernatant was then reconstituted in a final solution of 125 µL methanol of which 100 µL was injected for liquid chromatography. Cortisol was obtained from Sigma Aldrich (Bornem, Belgium), $D_4$-cortisol from CDN Isotopes (Quebec, Canada). All standards and internal standards were dissolved in methanol. Methanol, water and acetonitrile were LC-MS grade from BioSolve BV (Valkenswaard, The Netherlands). For Analysis an AB Sciex 5500 triple-quadrupole mass spectrometer (AB Sciex; Toronto, Canada) was used, coupled

with an APCI probe on the Turbo-V source. The liquid chromatography system consisted of a Shimadzu system using a C8 security guard column (5um, 4x2mm) and a C8 Luna analytical column (3um, 50x3mm) (Phenomenex; Torrance, USA). Measurements were performed by the tandem mass spectrometer running in multiple reaction monitoring (MRM) mode by using transitions m/z 363/121/97 for cortisol and $D_4$-cortisol on m/z 367/121/97. A declustering potential (DP) of 100 V and a collision energy (CE) of 32 eV was used for all the analyses. Data processing was performed through MultiQuant version 2.0.2. For analysis on 15mg hair, inter-assay CV for cortisol was 10.8% with an LOQ of 1.6 pg/mg hair.

### 9.2.4. Statistical analysis

Cortisol levels were transformed using an inverse square root function (range= 0.11-0.79, mean=0.41, SD=0.13), since these were demonstrated to be positively skewed (range= 1.60-78.67 pg/mg hair, median= 5.73 pg/mg hair, inter-quartile range= 4.52-9.06).

The association between cortisol and the study variables (stress related variables and possible confounding variables, such as BMI, WHR, and age) was assessed through Spearman correlation coefficients.
For differences in mean cortisol concentration between categorical variables (such as sex, smoking, alcohol use, ..), independent t-tests or Analyses of Variance (ANOVA) were conducted. Since these analyses revealed a significant association between age and HCC, analysis of covariance (ANCOVA) was conducted to assess differences in mean cortisol concentrations between categorical variables, adjusted for age.
A p-value smaller than 0.05 was considered to indicate statistically significant differences.
In order to enhance the interpretability of the data, the results for HCC in tables 3 and 4 are both presented as median (with inter-quartile range) of the original variable and mean (with standard deviation) of the transformed variable.
The analyses were conducted using SPSS 21.0 software.

## 9.3. Results

### 9.3.1. Study population

An overview of some descriptive information of the study population is displayed in table 9.1. The study population included in the analysis, consisted of 41 female (40.2%) and 61 male (59.8%) participants. Of them, 27.5% were blue collars, 35.3% were white collars and 37.3% were executives. Mean age was 43.4 years (SD=10.4).

| Variable | Categories | Number (percentage) | Mean ( standard deviation) | Median (inter-quartile range) |
|---|---|---|---|---|
| **Gender:** | male | 61 (59.8%) | | |
| | female | 41 (40.2%) | | |
| **Occupation:** | executives | 38 (37.3%) | | |
| | white collars | 36 (35.3%) | | |
| | blue collars | 28 (27.5%) | | |
| **Cortisol (pg/mg hair)** | | | | 5.73(4.52;9.06) |
| **Transformed cortisol variable** | | | 0.411 ( 0.132) | |
| **Age** | | | 43.40 (10.39) | |
| **Shift** | Only working regular hours during day | 78 (76.5%) | | |
| | Shift work | 24 (23.5%) | | |
| **Body mass index** | | | 24.44 (3.75) | |
| **Waist-hip ratio** | | | 0.911 (0.094) | |

**Table 9.1:** Descriptives of the study population (N=102)

### 9.3.2. Relation of cortisol in hair with stress measures

Table 9.2 displays the Spearman correlation coefficient between HCC and the continuous study variables. A significant correlation between age and HCC was detected ($r = -0.231$, $p<0.05$) while no correlation could be revealed between HCC and the several stress scales or the depression scale. No significant association was observed between HCC and possible confounding factors BMI, WHR.
The t-tests showed no significant differences in mean HCC for gender [$t$ (100) = -0.176, p=0.861], smoking [$t$ (99)= 0.420, p=0.675] and alcohol use [$t$ (100) =0.754, p= 0.453] (table9.3).

| Variable | Range | Mean | Standard Deviation | Median | Inter-quartile range | Spearman correlation with transformed HCC variable |
|---|---|---|---|---|---|---|
| Age | | 43.40 | 10.39 | - | - | -,231* |
| Job demands | 12-48 | 29.82 | 5.96 | - | - | -.060 |
| Job control | 24-96 | 69.43 | 9.49 | - | - | .028 |
| Social support | 8-32 | 22.84 | 2.93 | - | - | .129 |
| Cognitive demands | 0-100 | 68.20 | 14.69 | - | - | -.069 |
| Emotional demands | 0-100 | 32.17 | 19.58 | - | - | -.168† |
| Depressive symptoms scale | 11-33 | - | - | 14.00 | 13.00; 17.00 | .036 |
| Body mass index | | 25.44 | 3.75 | - | - | .004 |
| Waist-hip ratio | | 0.91 | 0.09 | - | - | -.058 |

*p<0.05;†p<0.10

**Table 9.2.:** Descriptive statistics for continuous exposure variables and correlation with hair cortisol concentration (HCC)

| Categorical variable | N | Original HCC variable | Transformed HCC variable: t-test | | |
|---|---|---|---|---|---|
| | | **Median (pg/mg), (inter-quartile range)** | **Mean (Standard Deviation)** | ***t* (df)** | ***p*-value** |
| **Gender** | | | | | |
| Male | 61 | 6.39 (4.26;9.02) | 0.413 (0.133) | *t* (100)= -0.176 | 0.861 |
| Female | 41 | 5.49 (4.70;9.30) | 0.408 (0.132) | | |
| **Obesity** | | | | | |
| BMI < 30 | 91 | 5.80 (4.70;9.03) | 0.407 (0.129) | *t* (100)= -0.875 | 0.384 |
| BMI ≥ 30 | 11 | 4.86 (3.51;9.37) | 0.444 (0.157) | | |
| **Risk for problematic alcohol use** | | | | | |
| No | 85 | 5.66 (4.31;8.99) | 0.415 (0.135) | *t* (100)= 0.754 | 0.453 |
| Yes | 17 | 7.92 (4.74;10.26) | 0.389 (0.117) | | |
| **Smoking** | | | | | |
| No | 87 | 5.94 (4.70;9.01) | 0.408 (0.133) | *t* (99)= 0.420 | 0.675 |
| yes | 14 | 5.21 (3.56;10.00) | 0.424 (0.134) | | |
| **Chronic disease** | | | | | |
| No | 82 | 5.87 (4.70;9.06) | 0.411 (0.132) | *t* (99)= -0.301 | 0.764 |
| Yes | 19 | 4.95 (4.24;13.61) | 0.401 (0.133) | | |

**Table 9.3**.: Difference in mean cortisol in hair for several confounding factors: results from the t-tests

In table 9.4, differences in mean level of HCC between the categorical measures are shown, adjusted for age, using ANCOVA. A significant relation between shift work and HCC was noticed, indicating that shift workers had a significantly lower mean HCC compared with day workers [F (1,99)= 5.630, $p<0.05$]. Persons reporting symptoms of depression had significantly higher HCC in hair than those without symptoms of depression [F(1,99)= 5.633, $p<0.05$]. Although higher HCC could be demonstrated for the highest tertile of most categorical stress measures, these differences were not significantly different at 0.05 level. Posthoc tests (Bonferroni) did not show any significant differences between individual categories.

| Categorical variable | N | Original HCC variable | Transformed HCC variable: ANCOVA[a] | | |
|---|---|---|---|---|---|
| | | **Median (pg/mg), (inter-quartile range)** | **Mean (Standard Deviation)** | **F** | **p-value** |
| **Shift work** | | | | | |
| Work during day only | 78 | 5.94 (4.71;9.40) | 0.394 (0.124) | 5.630 (1,99) | 0.020* |
| Shift work | 24 | 4.90 (3.21;8.76) | 0.465 (0.144) | | |
| **Depressive symptoms** | | | | | |
| No depressive symptoms | 86 | 5.57 (4.22;8.83) | 0.423 (0.130) | 5.633 (1,99) | 0.020* |
| Depressive symptoms | 16 | 8.00 (5.28;21.61) | 0.344 (0.122) | | |
| **Job demands** | | | | | |
| Lowest tertile | 39 | 5.66 (4.71;9.15) | 0.419 (0.129) | 0.245 (2,98) | 0.783 |
| 2nd tertile | 31 | 5.60 (4.16;9.95) | 0.416 (0.149) | | |
| Highest tertile | 32 | 6.08 (4.49; 8.95) | 0.396 (0.120) | | |
| **Job control** | | | | | |
| Lowest tertile | 37 | 7.33 (4.73; 9.19) | 0.399 (0.132) | 0.588 (2,98) | 0.557 |
| 2nd tertile | 32 | 5.44 (4.06; 8.09) | 0.423 (0.130) | | |
| Highest tertile | 33 | 5.94 (4.20; 9.37) | 0.412 (0.136) | | |
| **Social support** | | | | | |
| Lowest tertile | 29 | 5.94 (4.66; 9.43) | 0.398 (0.133) | 0.520 (2,98) | 0.596 |
| 2nd tertile | 33 | 5.80 (4.56; 10.46) | 0.400 (0.139) | | |
| Highest tertile | 40 | 5.41 (4.01;8.68) | 0.429 (0.126) | | |
| **Emotional demands** | | | | | |
| Lowest tertile | 31 | 5.04 (3.53; 9.03) | 0.448 (0.129) | 2.120 (2,98) | 0.125 |
| 2nd tertile | 31 | 5.44 (4.16;9.01) | 0.418 (0.135) | | |
| Highest tertile | 40 | 7.07 (5.31; 9.34) | 0.376 (0.125) | | |
| **Cognitive demands** | | | | | |
| Lowest tertile | 39 | 5.44 (4.62;9.25) | 0.409 (0.121) | 0.484 (2,98) | 0.618 |
| 2nd tertile | 36 | 5.57 (3.72; 8.21) | 0.430 (0.124) | | |
| Highest tertile | 27 | 6.78 (5.28; 14.38) | 0.387 (0.156) | | |

*p-value<0.05

[a]Adjusted for age

**Table 9.4.:** Work related and general stress variables and association with hair cortisol concentration (HCC), using ANCOVA

## 9.4. Discussion

The present study aimed to examine associations of HCC with several stress measures in a group of workers. It is one of the first studies conducted in a working population, which explores the relation

between HCC and work-related stressors, and adds to a few recent studies investigating the relation between self-reported work stressors, shiftwork and HCC [22-25]. Additionally, the association between HCC and symptoms of depression was examined in this group of workers. This study builds on former reports, examining cortisol as a potential biomarker for work stress, which have demonstrated inconsistent findings regarding the association between cortisol in saliva, serum and urine and psychosocial work stressors. These inconsistencies may be partly attributable to the matrices used in these studies, rather reflecting acute alterations of the HPA-axis and which are therefore probably less suitable as a biomarker for a chronic stressor. The present study wants to overcome these limitations by using a novel method, measuring cortisol in hair, which is assumed to be a more appropriate matrix for long-term retrospective cortisol concentrations.

We did not find a significant relation between the several dimensions evaluating specific features of the psychosocial work environment and HCC. This finding is in line with a recent study, which was not able to demonstrate a significant relation between HCC and job demands or job control [24]. However, in the present study higher cortisol levels were demonstrated in the highest tertiles of job demands, emotional and cognitive demands and in the lowest tertile of job control. This may suggest that those in the highest risk groups of these dimensions were having higher mean cortisol concentrations. Nevertheless, these associations did not reach significance at 0.05 level, nor did posthoc tests demonstrate significant differences between individual categories. Possible explanations for these findings may be the restricted variability in exposure in this study sample, with few participants perceiving very high levels of stress, and insufficient statistical power for detecting significant differences (post hoc power calculations for comparing high with low exposure groups showed power results <55% for these variables). An alternative explanation for these results may be that the well-established job stress models (e.g. model of Karasek) aim to measure the objective work stressors, rather than the subjective perception of the individual worker. Finally, the absence of significant associations may also be caused by lack of a specific time frame in the questionnaires and therefore rather measuring exposure to long-term job stress, while HCC reflects a specific time period (the last 2 à 3 months) corresponding to the length of the hair strand [32].

Shift work was also introduced as a possible source of work stress. We found significantly lower mean levels of HCC in shift workers in comparison with those working during the day. Generally, previous studies using cortisol in serum and saliva, determined that the cortisol awakening response is decreased and that the cortisol levels in the evening are increased, suggesting an impact of shift work on the circadian rhythm of the cortisol secretion [33, 34], but studies investigating the long-term changes of the cortisol levels are limited. Until now, only one study investigated the relation between HCC and shift work, revealing higher levels of HCC in shift workers younger than 40 years [22]. We additionally split up the sample in workers equal or younger than 40 years and those older than 40 years, since a significant interaction effect could be revealed between shift work and age in the relation with HCC. ANCOVA were conducted for both strata, revealing that only in the older shift workers a significant lower mean cortisol level could be detected in comparison with the day workers. A possible explanation may be the healthy worker effect: our sample of shift workers may be a selection of workers whose tolerance to this specific stressor is higher. Unfortunately, we have no information about age at start of working in shifts or the duration one is working in shifts. Another explanation may be found in the differences in defining shift work: the sample of shift workers in the study of Manenschijn et al. [22] only consisted of workers employed in a fast forward schedule, while our sample consisted of all those workers who were not working in the regular day work regime.

A second important result of our study is that, although workers with self-reported psychiatric disease were excluded, a significantly higher mean HCC was observed in workers reporting symptoms of depression compared to those not reporting these symptoms. Although this scale is not meant to diagnose a clinical depression, this finding underlines the results of former research [7, 35], which also identified higher levels of HCC in patients with major depression and generally subscribes the conclusion of Herbert, who attributes an important role to cortisol in onset and development of major depression [36].

Finally, it is worth mentioning that mean HCC levels in working populations show a remarkable variation between different studies. The study of Steinisch et al. [25] observed rather low mean HCC of 3.27 pg/mg hair, with a limited variance in a sample of young Bangladesh workers, while the median HCC in the study of Qi et al. [23, 24] was 12.5 pg/mg hair in the sample of young female Chinese teachers. Manenschijn et al. [22] found mean levels of HCC of 47.32 pg/mg hair for the older shift workers, and 29.72 pg/mg hair for the day workers in her study in the Netherlands. These differences may be explained by different exposure to stressors, but also race, age and predominantly laboratory technique (Enzyme-Linked Immuno Sorbent Assay *(*ELISA) versus LC-MS/MS) may be a source of confounding.

Although this study contributes to the existing knowledge on HCC and stress, some drawbacks have to be mentioned. A first limitation is the cross-sectional design, which does not allow distinguishing between cause and effect. Second, the low response rate and the number of workers who were not able to provide sufficient hair for determining the HCC may be a source of bias and limits the generalizability of our findings. Third, most of the scales used did not provide a reference time frame, which may a probable reason for the lack of established relationships between stressors and HCC. Finally, the limited number of cases restricts the statistical power of some of our analyses, which also may be an explanation for the lack of significant findings.

The major strength of our study is that we applied the method of HCC in a working environment, consisting of subjects who rated themselves healthy, and investigated the association of HCC with several work-related stressors. Not only the relation between HCC and work stressors was examined, but also with a scale evaluating symptoms of depression. Also our technique to quantify HCC is a particular strength, since LC-MS/MS generally is considered as superior to ELISA [37].

In conclusion, we observed no significant association between specific self-reported measures, related to several work-related psychosocial risk factors, and HCC. We revealed higher mean level of HCC in persons reporting symptoms of depression. These findings suggest a limited applicability of HCC as a biomarker of job stress and will be rather suitable for detecting early symptoms of stress-related illnesses. Nevertheless, further research should be performed in larger samples and in other occupational settings, preferably in a longitudinal design, with questions referring to the appropriate time frames in order to examine the reproducibility of our findings.

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# Chapter 10.
# General discussion

## 10.1. Summary of main findings

The overall purpose of this thesis was to enhance existing knowledge of the complex relation between job quality, health and attendance behavior.

The first aim was to examine several aspects of job quality in relation with attendance behavior, including both presenteeism and sickness absence. Measures of job quality relate to employment quality and work quality indicators.

In **Chapter 3**, the cross-sectional relation between **core dimensions of work quality**, representing the psychosocial work environment, and **presenteeism** was examined in a group of 2983 Belgian workers from the Belstress III study. Traditionally examined dimensions based on the well-established JDCS- and ERI-models were complemented with some less investigated measures, i.e. both directions of work-family conflict and bullying. Results were generally in line with previous research. High job demands and efforts were positively related to presenteeism, while there was no significant relationship between job control and presenteeism. Further, low rewards and low support were also significantly related to presenteeism. The added value of this study consists of the exploration of bullying and both dimensions of work-family conflict in relation with presenteeism. The results suggested a significant positive relation between bullying and presenteeism. There was no significant relation between high FWI and presenteeism, while the opposite direction, high WFI, was significantly related with presenteeism. An additional strength is that this independent relationship between psychosocial factors and presenteeism was not only demonstrated on the total group of workers, but also on a selection of workers with good self-rated health and low neuroticism.

In **Chapter 4**, **measures of work quality** were examined in relation with **two types of cause-specific sickness absence** in the Belstress III study population. Since psychiatric and musculoskeletal diseases are important causes of sickness absence, this study focused on registered long-term sickness absence due to mental diseases and long-term sickness absence due to musculoskeletal problems. Causes of long-term sickness absence were retrieved by contacting the general practitioner of the worker. Additionally, it should be noted that adjustments were made for several possible confounding variables, including baseline depressive symptoms and back complaints. The results demonstrate that low rewards were a risk factor for long-term sickness absence due to mental diseases. Work quality factors important for long-term sickness absence due to musculoskeletal diseases were low demands, low efforts and low job control. Bullying was a potent risk factor, contributing to both types of cause-specific sickness absence.

In **Chapter 5**, the objective was to get more insight into the complex interplay between two indicators of work quality (job strain and bullying) in relation with prospective registered sickness absence. Former research has already demonstrated the relation between several dimensions of the JDCS-model and sickness absence, while bullying also was determined as a risk factor for sickness absence. In this study, the focus was on **the interrelationship between job strain** (calculated as the ratio of job demands and control) **and bullying**, **which increases our understanding of the underlying pathways between job strain and sickness absence**. The analysis was conducted on 2983 workers from the Belstress III study. The results demonstrate that bullying was a mediating variable in the relation between job strain and long-term sickness absence (of at least 15 consecutive days).

In **Chapter 6**, the emphasis was put on employment quality as another part of job quality. Three **indicators of low employment quality,** i.e. job insecurity, long working hours and precarious contract, were examined in relation with **attendance behavior**, operationalized as several combinations of self-reported sickness absence and presenteeism. This innovative approach allows getting more insight into the interchange between absenteeism and presenteeism, when a worker is confronted with situations of low quality employment. The study population consisted of 28.999 workers from 27 European countries based on the Fifth European Survey on Working Conditions. Overall, results revealed that all three indicators of low employment quality were significantly related to different aspects of attendance behavior. Employees working more than 48h/week reported significantly less sickness absence without presenteeism, but they were reporting more presenteeism (whether or not in combination with sickness absence). Our findings concerning the relation between precarious employment and attendance behavior demonstrate an inverse relationship between precarious work and sickness absence. However, we did not find a significant relation between precarious employment and presenteeism without sickness absence. Additionally, we observed that workers with a precarious contract reported less presenteeism in combination with sickness absence. Finally, those perceiving high job insecurity were only reporting higher sickness presenteeism without sickness absence, while no significant relationship could be determined with the other attendance behavior categories.

A second aim of this thesis was to explore the relation between Body Mass Index category, as a behavior-related health indicator, and attendance behavior. The **relation between BMI** (normal weight, overweight and obesity) was examined in relation with **both sickness absence** (at least 10 sickness absence days during follow-up period) and **presenteeism** in a group of 2938 employees from the Belstress III study. The results, which were extensively presented in **Chapter 7**, demonstrate a significant association of both overweight and obesity with high sickness absence among women, but not in male workers. In contrast, overweight and obese men reported significantly more presenteeism in comparison with their normal weight colleagues, while this association was not observed in the female population. The results thus suggest a gender difference in the impact of overweight and obesity on attendance behavior.

A third aim was to explore **the prospective relation between presenteeism and several measures of registered sickness absence**, which was elaborated in **Chapter 8**. At the moment this study question arised (around 2012), only one author had prospectively investigated the relation between presenteeism and sickness absence duration, concluding that high rates of presenteeism were a significant risk for sickness absence [1]. However, this study was restricted to the total number of sickness absence days and therefore ignored the number of episodes or the length of the separate spells of sickness absence. Since it was demonstrated that other mechanisms play a role in different measures of sickness absence, the present study expanded current knowledge by evaluating the prospective relation with different types of sickness absence (short spells between 1-3 days, long spells of at least 15 consecutive days and frequent absence of at least 3 spells during follow-up). The study questions were tested on 2983 Belgian workers from the Belstress III study. In conclusion, the study demonstrated that presenteeism was related with several measures of future sickness absence, especially long sickness absence.

The final study aim in **Chapter 9** addressed **the feasibility to use hair cortisol as a biomarker of work quality**. It was hypothesized that work stress measures would be positively associated with HCC. This research question was examined in a pilot study sample of 102 workers free from psychiatric or neuro-endocrine disease and who were not treated with glucocorticoids. No significant associations could be revealed between HCC and standardized measures related to work psychosocial

risk factors. A significantly lower mean HCC was found in shift workers in comparison with day workers. Additionally, a significant higher mean HCC was demonstrated in workers with symptoms of depression. In conclusion, HCC showed a limited applicability as a biomarker of work quality in this sample, although the results suggest this method may be a suitable marker for detecting early symptoms of depression.

## 10.2. Discussion of findings

### 10.2.1. Work quality and attendance behavior

Generally, findings underline the importance of work quality factors in the attendance behavior of employees and highlight that this behavior is not purely driven by the health status of the worker.

The results from Chapters 3, 4 and 5 demonstrated that **particular dimensions of the well–established JDCS and ERI-models were associated with sickness absence and presenteeism**, underlining the importance of job quality for attendance behavior.
Although these most common applied job stress models were originally developed to predict stress-related physical and psychological problems, they are also valuable in explaining sickness absence and presenteeism. Generally, high job demands and high efforts were significantly related to presenteeism, while low demands and low efforts were related to cause-specific sickness absence due to musculoskeletal diseases. A possible explanation may be that high job demands is a proxy for the variation in tasks, which may lower the sickness absence due to musculoskeletal diseases [2]. These findings may also alternatively be explained by the substitution hypothesis in which employees with high job demands are forced to choose for presenteeism instead of sickness absence [3]. Low job control was significantly related with long-term sickness absence due to musculoskeletal disease, while no relation was found with presenteeism. In contrast, low rewards was significantly related to presenteeism, while high rewards was associated with a lower risk for both types of cause-specific sickness absence. The latter finding may be explained by the fact that 'high reward' jobs may represent the more healthier jobs with less risks for musculoskeletal problems. Also the financial situation and the subjective feeling of job insecurity are incorporated in this dimension, which may explain the relation of low rewards with presenteeism [4]. Social support was not significantly related to long-term cause-specific sickness absence, while there was a positive relation between low social support and presenteeism. Findings in literature with respect to this dimension are inconclusive [5-8]. Generally, this significant relation between low support and presenteeism was explained by the fear a worker may perceive to take sickness absence in case of low social support [6].
In conclusion, the results suggest that some of these dimensions are not consistently interpreted across several jobs. High job demands may reflect another risk in predominant physically demanding work when compared with the demands of white collars. Additionally, some authors suggest that these dimensions do not cover the whole range of stressors an employee is exposed to in the current changing labor market. In certain jobs also emotional and cognitive demands may be an important stressor, influencing the attendance behavior [9-13]. The latter two types of demands are, for instance, not included in the JDCS- or ERI-model. Additionally, our results also suggest that less examined stressors, such as job insecurity, bullying and work-family conflict should be more systematically considered.

A second disadvantage, specifically related to the JDCS- model, is that this model does not take into account the inter-individual differences in reaction to the stressors. The latter was inserted in the ERI-model as the intrinsic component of overcommitment, which therefore makes the ERI-model a transactional model [14, 15] . The transactional views put emphasis on the importance of the individual perception of the work environment and acknowledge that appraisal of the stressor and personality may play a role in the further mechanism between stressor and health problem [15, 16]. Since former research demonstrated the importance of personality in attendance behavior [17-19], using the JDCS-model for explaining this kind of behavior, may be a too narrow approach.

The results further demonstrated that the **JDC-model** was a valuable model in **describing the origin of bullying**, through which at least a part of sickness absence was explained. The latter finding suggested that job strain possibly creates a work atmosphere in which bullying behavior will escalate, in turn causing sickness absence. This finding is generally in line with the 'work environment hypothesis' of bullying [20, 21], which is now followed by most investigators in this research area [22-25]. This situational interpretation emphasizes the importance of organizational work factors, such as bad job content, in the origin of bullying and provides more insight into the mechanism behind the relation between job strain and attendance behavior.

Another important conclusion, derived from Chapters 3, 4 and 5, was the significant **relation between bullying and attendance behavior**. Bullying seems to be a very potent stressor, significantly associated with both sickness absence measures and presenteeism. This was also suggested by a former study, which revealed that, among several psychosocial risk factors, bullying appears to have the strongest association with sickness absence [26].
Several explanations may clarify the association between bullying and sickness absence, a relation which has also been recognized in former research [27-29]. Sickness absence may be considered as a coping mechanism: it offers the victim of bullying an escape, to withdraw from the noxious working environment [30]. However, several studies demonstrated that exposure to bullying will also lead to several adverse health effects [31-34]. So, it may be possible that the significant association between bullying and sickness absence, rather suggests that bullying is a real threat for the victim's health. Consequently, sickness absence following bullying exposure, will sooner be a reflection of a real health problem instead of a coping behavior. This explanation is actually underscored by the fact that we found a significant relation between bullying and long-term sickness absence, which is mostly considered as a reflection of health status [35].
The relationship between bullying and presenteeism has not been extensively investigated earlier. Our results however, were recently confirmed by a study of Conway et al. [36]. In this study, the relation between bullying and presenteeism was explained by the conservation of resources theory [37]. This theory hypothesizes that workers exposed to workplace bullying, will adopt behaviors that primarily are meant to prevent further resource loss. Thus, in the early stage of the bullying process, the main reason for a bullying victim to attend work while ill, may be to prevent rumours or undesired work changes, which could aggravate the negative working environment and lead to further isolation. This is in line with former research, which demonstrated that in the early stages of the bullying process, active and constructive ways of coping are used [38]. In later phases of bullying, victims tend to more frequently use passive and avoiding coping behaviors, such as work withdrawal [38], which is in accordance with research demonstrating a relation between bullying and sickness absence [27-29].
In conclusion, this discussion demonstrates the complexity of the relation between bullying and attendance behavior. Based on the substitution proposition [3], which is essentially stating that absence is substituted for presenteeism or vice versa, it is expected that if bullying leads to higher sickness absence, lower levels of presenteeism will be found. Our findings, combined with other results [39],

suggest that sickness absence and presenteeism should not be seen as straightforward alternatives for each other, but as two possible consequences of a complex decision making process. Consequently, we can conclude that the relation between bullying and attendance behavior merits further research, to disentangle the real meaning of sickness absence and presenteeism in victims of bullying.

The results of Chapter 3, investigating **the relation between both directions of WFC (i.e. WFI and FWI) and presenteeism** add to the scarce literature on this topic. Uptil now, only one study demonstrated that WFI was significantly associated with presenteeism [40], which was confirmed by our results. Someone experiencing duties at work to be interfering with the family responsibilities, seems to choose rather for presenteeism when sick. Interestingly, the majority of former studies also found a significant relation between WFI and higher sickness absence [41-43]. The latter finding, however, was not only contradicted by Johns [40], but also in a former study conducted on the Belstress III population [44], showing no significant relation between WFI and absenteeism. The other direction, FWI, was not significantly related to presenteeism in our study, which was in line with expectations based on the study of Johns [40]. He hypothesized that FWI would be negatively or not related to presenteeism, but positively to sickness absence. This hypothesis, however, was in contrast to the findings of previous research, in which no consistent relation between FWI and absence was observed [43]. These inconsistent findings may be due to different operationalisations of both exposure variables and outcome variables, or differences in study design and study population. Nevertheless, these findings generally underline not only the bi-directionality of the concept of WFC, but also the importance to examine the relation with both sickness absence and presenteeism.

### 10.2.2. Employment quality and attendance behavior

The relation between employment quality and attendance behavior was investigated in Chapter 6. As expected, an inverse relationship between precarious employment and sickness absence was demonstrated. On the other hand, no significant relation was shown between precarious employment and presenteeism without sickness absence. Additionally, we observed that workers with a precarious contract reported less presenteeism in combination with sickness absence. The latter two findings were somewhat surprising, since it was hypothesized that workers with a precarious contract will report lower absenteeism figures and hence will demonstrate higher presenteeism. A possible explanation is that this group of workers with a precarious contract may consist of a rather heterogeneous population, in which the perception of job insecurity may vary. Therefore, the findings for the relation between subjective job insecurity and attendance behavior may provide further insight. Results indeed demonstrate that workers perceiving high job insecurity were only reporting higher sickness presenteeism without sickness absence, while no significant relationship could be found with the other attendance behavior categories. This suggests that especially the feeling of insecurity is creating a situation in which a worker will choose for continuing working despite illness, while workers with a precarious contract do not seem to have a higher risk for presenteeism.

### 10.2.3. Body Mass Index and attendance behavior

As demonstrated by Gosselin et al., some specific health problems lead more frequently towards presenteeism, while others have an impact on sickness absence [45]. The results of Chapter 7 suggest that the condition of overweight and obesity has different consequences for the attendance behavior of men and women. Overweight men were more prone to go to work despite being ill, whereas overweight

and obese women were more at risk for augmented sickness absence. This was already suggested by previous authors, who also identified a differential gender effect on certain health problems related to attendance behavior. In women, back problems were related with presenteeim, but not with absenteeism, while in men the opposite relation could be revealed [45].

### 10.2.4. Hair cortisol concentration as a biomarker for measuring stress related to indicators of work quality

Although the current study aims to contribute to the further in-depth exploration of a biological approach for epidemiological stress research in the work environment, the current findings (presented in Chapter 9) suggest a limited applicability of HCC as a biomarker of work quality. We observed no significant association between HCC and several work-related psychosocial risk factors, which was in line with previous research finding inconsistent relations between psychological and biological measures [46, 47]. However, a higher mean level of HCC was revealed in persons reporting symptoms of depression, suggesting that HCC is rather suitable for detecting early symptoms of stress-related illnesses. Nevertheless, it should be mentioned that in this cortisol pilot study, we may encounter an insufficiency of power and a shortage of variability in exposure, with a rather low number of participants perceiving high stress levels. Consequently, this restricts the possibilities to detect statistically significant differences between measures of job quality and cortisol in hair. Notwithstanding, it should be noted that workers in the highest risk groups for several dimensions measuring specific aspects of work quality showed higher mean cortisol in hair concentrations. Although no statistically significant results could be detected, this finding may suggest that exposure to unfavorable work quality conditions possibly results into higher HCC levels. However, to fully understand the potential importance of hair cortisol analysis as an additional or substituting tool for large-scale psychosocial stress research, further research should be undertaken in larger and more heterogeneous populations.

### 10.2.5. Presenteeism and prospective sickness absence

The study presented in Chapter 8, was one of the first to suggest presenteeism as a risk factor for future sickness absence. In the meanwhile, several studies have confirmed our results [48, 49]. The observed relation between presenteeism and sickness absence is generally explained by the allostatic load hypothesis: insufficient recuperation from illness may cause accumulated tiredness, which therefore further harms the health of the employee [50, 51]. Subsequently, this will reduce the capacity to remain at work in the long term. These findings therefore underline the possible negative consequences of presenteeism behavior for the individual worker.

### 10.2.6. Interplay between absenteeism and presenteeism

As far as the specific interplay between presenteeism and sickness absence is concerned, the complementary hypothesis and the substitution hypothesis have been suggested. As explained earlier, the substitution hypothesis mainly considers the use of presenteeism behavior as a replacement for sickness absence, while the complementary theory states that the two behaviors are closely correlated with each other through the influence of common determinants. This issue could only be formally

addressed in Chapter 6, which revealed no clear support for the substitution nor for the complementary hypothesis. The findings from Chapter 6 concerning the relation between long working hours and attendance behavior, support - to some extent - the substitution hypothesis: workers with long working hours seem to choose for presenteeism instead of sickness absence. Results for the relation between precarious contract and attendance behavior could not provide evidence for this substitution hypothesis nor for the complementary hypothesis. Workers with a precarious contract do not seem to substitute presenteeism for sickness absence. Notwithstanding, also from the other chapters some further discussion can be developed with respect to this issue. For instance, high efforts and high demands were associated with higher levels of presenteeism, while higher efforts and higher demands were significantly related to lower sickness absence due to musculoskeletal disorders. At first sight, this may be a confirmation of the substitution hypothesis, in which the worker is replacing sickness absence by presenteeism. Theoretically, it is also possible that some of these workers are perceiving stress, which makes them more susceptible to illness. Therefore, they are probably more likely to exert both presenteeism and sickness absence (other than long-term sickness absence due to musculoskeletal diseases). Some former studies indeed demonstrated a significant and positive relation between job demands and sickness absence [52, 53]. The latter finding was however not supported by some additional analyses in the Belstress III population, revealing an inverse association between job demands/efforts and several measures of sickness absence (results not shown). Additionally, working in a stressful environment may create a matrix in which other types of stressors, such as bullying, may develop. These stressors may in turn have their own specific impact on attendance behavior.
In conclusion, we can state that there are several factors, which seem to exert a joint impact on both sickness absence and presenteeism, while others are playing an opposite role on the two components of attendance behavior.

### 10.2.7. Gender differences

Another point that needs some further discussion, is the gender aspect. Stratification for gender was, due to several reasons, not applied in every chapter. However, this issue was always carefully considered, since former research demonstrated gender differences in sickness absence behavior [54, 55]. This gender difference was explained by both a vertical and horizontal segregation of the labor market [56]. Women are more often found in lower white-collar positions, while men have more frequently higher white-collar and management positions, but also blue-collar jobs. With respect to the horizontal segregation, it is demonstrated that women work more often in sales, clerical, nursing, childcare and teaching jobs. Consequently, important differences in job quality characteristics have been noticed between men and women. Generally, women report less job control (fewer learning opportunities and less decision-making tasks) than men, while men are more often in the physically demandings jobs [57]. Former research demonstrated that differences in occupations, but also differences in workplaces, accounted partly for the gender difference in sickness absence [58]. Besides the differential impact of occupational and workplace factors, also health may contribute to the explanation. For instance, mental and behavioral disorders are more reported by women [59], and are likely to be reflected in sickness absence figures.
Although this gender issue was not the main focus in this thesis, interaction effects between gender and the independent variable in relation with the outcome were every time checked in preliminary analyses. Main findings from these preliminary analyses showed significant interaction effects between gender and presenteeism with regard to long spells of sickness absence, and between gender and BMI in relation to attendance behavior. In the other relations, gender did not play an effect modifying role, which is in line with findings of former research [45, 60].

## 10.3. Methodological issues and limitations

### 10.3.1. Study design and study population

A general issue that needs mentioning is that the study questions were tested in three separate study populations. Although this aspect underscores to some extent the generalizability of our findings, it limits the uniformity of operationalization of some of the outcome variables. Even if the Belstress III study and the EWCS had the advantage that these studies covered a broad range of work-related and socio-demographic variables, still some information was not sufficiently detailed, which is an inherent shortcoming of secondary data analysis.

A first limitation is that a number of results were based on cross-sectional results. This is particularly the case for results presented in Chapter 3 (assessing the cross-sectional association between work quality and presenteeism), in Chapter 6 (assessing the cross-sectional association between employment quality and attendance behavior) and in Chapter 7 (assessing the cross-sectional association between BMI and presenteeism), for which we were not able to provide causal explanations. The results therefore should be treated as associations.

One of the major advantages of the Belstress III study consists of the longitudinal design with respect to the sickness absence data. This design permits to determine risk factors for sickness absence. Nevertheless, the follow-up period of one year may be too short to discover the full effect of these risk factors on some aspects of the health status of the employee and related sickness absence [61].

A second limitation is that the Belstress III and the cortisol pilot population do not consist of a representative sample of the Belgian working population. Additionally, it should be noted that Belstress III data were collected in 2004, implying that these are not up-to-date. Therefore, some caution should be made when generalizing the results. Nevertheless, in analytical studies, where possible relationships are examined, the variation of exposure is of more importance than representativeness of the population [62]. Therefore, it is not likely that this aspect causes large problems for the papers based on the Belstress III study. However, since variation of exposure was limited in the cortisol pilot study, this drawback should be kept in mind when interpreting these results.

Another limitation is the rather low response rate of 30% in the Belstress III study, which could have introduced a selection bias in the study population. This low response rate may be explained by the large number of surveys a worker is confronted with, but also by the fact that the distribution procedure of letters and questionnaires was organized within the setting of the companies. Although confidentiality was guaranteed, this may have caused a certain suspiciousness. From the participating companies, additional information was obtained regarding non-respondents. This revealed no important differences in age and gender between responders and non-responders. However, the proportion of non-response was higher in lower occupational groups. Additionally, it was not feasible to examine whether non-respondents differed from respondents with respect to other variables, such as sickness absence or presenteeism. This remark should also be made for the cortisol pilot study, where a response rate of 15% was obtained.

In the context of this kind of research, also the healthy worker effect should be noted. The healthy worker effect suggests that workers exhibit a better health than the general population, since ill people are usually excluded from employment [63]. This implies that healthy workers are more likely to participate in studies like these, which will lead to an underestimation of the prevalence rates of health problems. Additionally, those workers with robust health (or having other characteristics that contribute to low absence) are also more likely to accept jobs with difficult working conditions. Consequently, this possibly causes an underestimation of the true associations.

### 10.3.2. Measurements

#### a) Use of self-reports

Measurements of employment quality and work quality were based on self-report assessments.
When both independent and outcome variables are assessed by using self-report measures (which is the case in results presented in Chapter 3, Chapter 6 and Chapter 7), it is assumed that relationships between these variables may be inflated by common method variance. However, Spector suggested that biases introduced by the use of self-reports are overstated [64].
Empirical evidence illustrated that features such as social desirability or negative affectivity should not be considered as automatic sources of common method variance when self-reports are used.
Moreover, in a number of the papers in this thesis, the relations were adjusted for a measure of negative affectivity (neuroticism). In Chapter 3, additional subgroup analysis was conducted on a limited sample with low neuroticism, as a precautionary measure to reduce common method variance.
Additionally, questionnaires such as the JCQ based on the JDCS-model, aim to gather information about the objective environment [65]. In the design of the JCQ, the purpose was to minimize the self-reflective aspect in the questions.

#### b) Measurement of work quality

It should be noted that measurements of work quality in this thesis are mainly related to job content, psychosocial exposures and social relations. In the introduction, work quality was defined as being composed of both working conditions (which is also including biochemical and physical circumstances) and job content. Unfortunately, except for physical demands derived from the JCQ questionnaire, no information was available on the physical and biochemical exposures the workers were imposed to.

#### c) Bullying questionnaire

The results and conclusions with respect to bullying may be limited by the use of the bullying questionnaire. This questionnaire is based on the Quine inventory [66], which has rather limited application until now.
In research, mainly two methods to measure bullying can be distinguished: the self-labeling method and the behavioural experiences method [67, 68]. The self-labeling method assesses the person's overall feeling of being victimized by bullying, while the behavioral experience method assesses the person's perception of being exposed to a range of specific bullying behaviors. Both methods have their own advantages and disadvantages. The advantage of the self-labeling method is that the questionnaire is short and easy to apply. The main disadvantage is that this is a very subjective approach, which may

be biased by personality, emotional and cognitive factors. Another disadvantage is that this method does not provide insight in the nature and consequences of bullying. The alternative behavioral experience method, in which the respondents are presented a number of unwanted and negative behaviors without explicitly referring to 'bullying', is also an often applied method. The respondents are asked to report how frequently they have to face these behaviors, during a given reference period. A main limitation is that there is a lack of knowledge about the accuracy and factor structure of these type of instruments. A second disadvantage is that these scales are meant to be used as sum scores (implying a level of exposure to bullying), rather than being applied as an instrument to distinguish between targets and others.
The scale of Quine [66] can be considered as a behavioral experience method. In addition, it should be mentioned that this scale is also limited by the absence of a reference period [67], which possibly could lead to a bias. An important strength, is that the author of the original scale aimed to capture several dimensions of bullying. However, the construct validity of the scale has not been widely established yet. Therefore, in chapter 5 of the thesis the questionnaire was studied more extensively by conducting a stepwise EFA and CFA. It was possible to recognize the different latent factors, proposed by the author, which additionally supports the validity of this questionnaire.

**d) Presenteeism assessment**

A first inherent aspect of measurement of presenteeism is that these figures are based on self-reports. As mentioned in the introduction of this thesis, it is difficult to obtain objective figures of presenteeism and it is a complex problem to establish the validity of presenteeism measures. While it is conceptually easy to validate self-reported absence data against objective registration data, validating presenteeism is a challenging task, given the nature of the data being collected. To overcome this problem, some of the research tries to measure the decline in productivity, since this is one of the consequences of presenteeism behavior. Productivity can be measured in certain jobs or occupations. However for most jobs (typically knowledge based jobs), there is no true account for assessing the workers' productivity. Additionally, one can expect that the influence of presenteeism on productivity will vary between different occupations and is also determined by personal and work-related factors. Besides these productivity measures, inspired by the North-American school, other measurement instruments to quantify the 'act of presenteeism' itself have been used. The one-item question applied in this thesis (including some variations on it), is the most frequently used instrument [1, 17, 60, 69-75]. One-item questions also have been applied to asses other behavioral outcomes, such as intent-to-leave, turnover behavior and sickness absence [76-78]. Nevertheless, the application of this presenteeism question has been criticized: the discontinuous frequency scale has been judged too crude and also the time frame of 12 months is subject of debate [19]. A test-retest reliability of $\geq 0.58$ has been reported for this question for 6 months and 1 year intervals [72]. In attempt to optimize this presenteeism measure, Johns proposed to use an open question [19]. The worker is asked to fill in on how many days he or she demonstrated presenteeism behavior. However, this approach has been applied in only a few number of studies until now. It should further be noted that in the ESWC, the answer categories were 'yes', 'no', after which a second question assesses the number of days the worker shows this behavior. Nonetheless, we applied only the dichotomous variable to operationalize attendance behavior.

It can be concluded that this single item question has definitely some serious drawbacks, but applying this question has the main advantage that results are comparable with other studies, since the measure has been applied in the majority of research in this area.

**e) Operationalization of attendance behavior**

A remark that might arise is that no consistent operationalization of attendance behavior measures was applied throughout the thesis, which is due to several reasons.

With respect to the collection of sickness absence data, several approaches are described in literature, of which the objective sickness absence data records are considered as most reliable. Nevertheless, also self-reported sickness absence data have been shown to be a valid measure in correlational research [79]. In the Belstress III study, objective sickness absence data were collected, which is a particular strength of this study. Results in Chapter 6 are based on self-reported absence data from the EWSC survey, as a cheaper and less time-consuming alternative for record data. As extensively discussed above, presenteeism data are commonly based on self-reports, which is also the case in this thesis.

The fact that several outcomes of sickness absence (short-term sickness absence, long-term sickness absence, frequent absence, absence duration) are used may also be subject of debate. Generally, in literature a variety of measures is being used, with a very wide range of cut-off points. Therefore, it can be concluded that there is no consistency regarding the operationalization of sickness absence measures in this research area [80]. Another important shortcoming in some studies is that a rationale for the selected absence measure is lacking [80].

The reasoning for the use of the separate measures of sickness absence is specifically discussed in the Chapters. Nonetheless, the rationale is generally based on the following assumption. Differences in sickness absence duration and frequency may be a reflection of the underlying processes. Short-term sickness absence and high absence frequency are assumed to be more related to attitude and may be the expression of a coping behavior, in which the worker tries to withdraw from a stressfull situation. Long-term sickness absence is suggested to be particularly related to ill health and the inability to perform work tasks [35, 81]. A second aspect, which we had to take into account in the Belstress III dataset when choosing the cut-off points for the measures, was the time lag of one year between exposure and outcome period. This implies that we cannot expect to capture yet the full health effect of the exposure variable. This involves that there would be a risk of underestimation when we would have defined 'long-term sickness absence' in terms of months, which consequently clarifies our definition of long-term sickness absence as at least 15 consecutive days of sickness absence.

In the majority of the chapters, persons who reported that they came to work despite being ill 2 to 5 times or more during the past year, were considered as demonstrating presenteeism, following earlier research in this field [17, 60, 70]. However, in the study based on the EWCS, one day was used as cut-off value for presenteeism, in order to be consistent with the definition of sickness absence (at least one day). Nevertheless, additional sensitivity analyses were conducted with alternative cut-off values for both sickness absence and presenteeism, which roughly led to highly similar results.

**f) Biological approach to assess stress related to work quality**

Although using hair as a biological matrix for cortisol analysis offers a substantial advantage for application on a large scale in epidemiological work stress research, some important limitations and problems should be mentioned.

First, there are considerable differences between laboratory analysis methods which urges the need for creating a gold standard in order to allow comparisons between research groups [47]. Presently,

important differences exist in the amount of hair needed (between 5 to 50 mg), the storage methods, the hair processing technique (pulverizing, grinding, mincing), the washing procedure, the cortisol extraction method and analysis method (eg. immunoassays, chromatography) [47, 82, 83]. These differences may partly explain the remarkable variation in HCC levels between different study populations. But also the potential confounding by age, race, use of hair products, etc. may account partly for these differences [83, 84].

Finally, application of hair analyses in a general population sample will have to deal with the issue of insufficient hair (growth) at the vertex posterior region, which may be a problem in men with shorter shaved heads, or people who have religious or aesthetic objections against hair sampling.

## 10.4. Directions for future research

Although the present results offer more insight into the complex dynamic between job quality, health behaviors and attendance behavior, particular aspects need to be addressed in further research. Some topics which deserve specific attention are briefly discussed below.

A first important conclusion is that further research should simultaneously examine sickness absence and presenteeism. Following Johns [19], every model that seeks to explore sickness absence should take into account presenteeism and vice versa. Hence, further efforts should be made to disentangle the relational dynamic between presenteeism and sickness absence, ideally in longitudinal studies and in representative samples of workers.
As mentioned in the limitation section, the one-item measure of presenteeism is rather controversial [19]. A possible alternative can be offered by using daily diary registration, which may reduce the problem of recall bias and increase insight into short time variation of presenteeism behavior. This registration can be done on paper and pencil format, but may also be facilitated by using electronic devices. This method may create opportunities for the validation of some often used and easy applicable presenteeism questions.
In this context, also assessing the beliefs and attitude of the worker towards sickness absence may provide further insight into the specific relation between both aspects of attendance behavior and may help to develop a broader theoretical framework in which attendance behavior can be embedded.
Further, it should be mentioned that the attendance behavior may not be completely captured by presenteeism and sickness absence. In a recent editorial, the term ‘leaveism’ was introduced, as the “missing link” [85]. This behavior is defined as the situation when an employee uses her or his own time (such as resting days, annual leave entitlements etc.) to avoid the workplace when he or she is in fact ill. Also the behavior in which workers take work home that cannot be completely done during working hours or when workers are working during holidays, is referred to as leaveism. Consequently, attempts should be made to develop models covering the complete attendance dynamic, in which also leaveism behavior may be considered.

Furthermore, the specific role of sickness absence or presenteeism as a reaction to the exposure to an adverse work environment should be explored: is the attendance behavior a reflection of the health situation or is it rather representing a coping behavior? In this perspective, the investigation of the

precise physiological mechanism through which the relation between job quality and attendance behavior may be explained, can provide more insight. From the hair cortisol pilot study, some specific recommendations for future research, which are detailed in Chapter 9, can be made. Further investigations on the relation between job quality and other candidate biomarkers (such as heart rate variability and cortisol in saliva) are warranted.

Finally, it should be commented that the majority of studies particularly asses presenteeism as a behavior with negative consequences for both employer and worker. However, presenteeism may also have some positive effects. For instance, in the situation where an employer is offering a flexible working arrangement to ill workers, involving a combination of work and sickness absence (such as working part-time, or working full-time hours but with modified tasks or with reduced output), workers are also demonstrating "presenteeism". This graded sickness absence is effective in keeping employees with reduced work ability in work-life [86], and this exerts a positive effect on the health and wellbeing of these workers [87, 88]. Consequently, further research is needed to distinguish 'healthy' presenteeism from 'noxious' presenteeism.

Another important conclusion from the present studies, is the major impact of bullying on attendance behavior. However, the traditionally applied job stress models do not include this dimension. Hence, when examining work quality, more attention should be paid to the aspect of bullying. Additionally, the interchange between several aspects of job quality is worth examining: the isolated determinants will not only have a single effect on attendance behavior, but may interact with each other and therefore buffer or reinforce the separate effects.

Even if the results of the present thesis do not reveal a major impact of gender on the relationship between job quality and attendance behavior, this topic certainly merits further consideration. Especially since a conventional and generally accepted explanation for the finding that women are demonstrating more absenteeism than men is not yet provided by former research [54], further exploration of the gender related features of the relation between job quality and presenteeism may give insight.

It is finally recommended to further explore the biological approach for assessing job quality indicators, in order to explore the feasibility to use this as an additional or substituting tool for large-scale psychosocial stress research. In this research area, hair sampling was experienced as a feasible, low burden and non-invasive technique which offered considerable logistical advantages compared to other biological samples. Therefore, further attempts should be made to optimize the current laboratory techniques and further explore the confounding factors in the relation between the stressor and the biological response. Additionally, the use of HCC as a stress biomarker should be expanded to larger and more heterogeneous populations (e.g. including a broad variation in job stress exposure, including different races, including more diverse socio-economic environments).
Further, more attention for the application of this biological approach in longitudinal and interventional studies would allow getting more insight into the practical usefulness of HCC as a biomarker of stress. For instance, a management strategy aiming to enhance job quality, may influence the HPA activity of workers, which would be reflected in cortisol concentration of segmental hair analysis [89].

## 10.5. Implications for practice and policy makers

Overall, the results demonstrated that not only health and health behaviors, but also work quality and employment quality are important determinants of attendance behavior.
Intervention programs aiming to enhance the quality of jobs and to decrease the impact of stressful jobs on health can be organized at several levels. Following the proposal of Murphy et al. [90], four levels of interventions can be distinguished: a) the individual level; b) the job/task level; c) the employer/organization level; d) the legislative/policy level. Within each level, interventions can be primary, secondary, or tertiary in nature, depending on the target for change and the outcome. Primary interventions aim to protect workers who do not have problems yet and to maintain them in good health. Secondary interventions aim to detect early stages of illness due to stress. Finally, tertiary interventions consist of reducing long-term disability and focus, for instance, on facilitating return-to-work. In table 10.1, an overview of a number of interventions and programs are summarized. Some of them are more profoundly discussed below, concentrating on their probable effect on attendance behavior.

| Levels of intervention | Primary | Secondary | Tertiary |
|---|---|---|---|
| **Legislative/policy** | Legislation to limit number of working hours;<br>Legislation to limit mandatory overtime | Workers compensation | Social security and disability |
| **Employer/Organization** | New systems of work organization;<br>Workplace health programs;<br>Work-family programs | Health promotion programs | Return to work programs |
| **Job/ Task Characteristics** | Job redesign;<br>Job rotation | Providing light jobs | |
| **Individual/ Job interface** | Health promotion programs | Stress management programs;<br>Disease management programs | |

**Table 10.1.:** Overview of levels of work organization and stage of intervention [90, 91].

Bearing in mind the burden associated with both sides of attendance behavior, employers who aim to reduce costs related to absenteeism, should also take into account the phenomenon of presenteeism. Indeed, a human resources strategy that targets to tackle sickness absenteeism and purely focuses on reducing the sickness absence figures, may have a certain degree of collateral damage by increased presenteeism.

Both sickness absence and presenteeism are not only driven by the health status of the worker, but by several other factors. Therefore, exclusively implementing health-promoting activities without considering the possible impact of working conditions and the psychosocial working environment, is not recommended. Regretfully, this approach is commonly applied in the United States, where traditional health programmes mainly focus on the individual, without taking into account organizational causes of sickness absence and presenteeism in the workplace [91]. Nevertheless, **health promotion in the workplace** may have some effect on productivity, which is supported by a recent meta-analysis, examining 42 intervention studies. This meta-analysis concluded that there is evidence for worksite health-promotion programmes - such as campaigns focusing on smoking prevention and cessation, physical fitness, healthy nutrition, weight management, stress management, high blood pressure control, cholesterol reduction and cardiovascular disease prevention – to deliver an average reduction in absenteeism [92]. Participants in workplace health promotion programmes demonstrated about 25% lower absenteeism than nonparticipants. However, an important remark is that there is generally a lower participation rate for these kind of programmes in lower educated and less healthy workers [93]. Additionally, Goetzel et al. provided some recommendations in their review [94]. One of their remarks was that, if the only expectation of the employer is to 'make money' by implementing a workplace health programme, it may not be worth the effort. Further, establishing a culture of health in the workplace is highlighted as a crucial feature of a successful programme in this review.

Intervention studies investigating the effect of workplace health promotion programmes on presenteeism are rather scarce. A systematic review concluded that there is preliminary evidence that some interventions can positively affect presenteeism [95]. A specific type of health promotion in the workplace, is personal stress management, which primarily aims to increase the coping skills and behaviors of workers to deal with stress. These programmes may have some positive benefits, but it is not known if effects are prolonged. Moreover, if employees have to cope with an unfavourable work environment, in which no efforts are made to change the situation, these positive effects may be undone [96].

Besides these health promotion programmes in the workplace, which are essentially focusing on health and health behavior at the individual level, **interventions at job level or at organizational level** in order to change task characteristics, work conditions or social aspects, have shown their potential to be effective [97]. Intervention approaches using a participatory approach are likely to be the most promising ones [91]. This participatory approach is one of the requirements in the Belgian law concerning psychosocial risks at work: a risk assessment of psychosocial aspects has to be made in collaboration with the employees, resulting in the proposal and implementation of appropriate preventive measures [98]. Generally, it is recommended to intervene in the workplace organization, i.e. to increase job control and influence over decisions, enhance task variety and enrich the job content, avoid 'passive jobs', encourage solidarity among workers and ensure support from hierarchy [91]. The results from this thesis underline the importance of several of these aspects in the attendance behavior of workers. Additionally, emphasis should be put on the prevention of bullying, which is suggested to have an important impact on attendance behavior. In this context, our work reveals that reducing job demands and increasing control may also prevent bullying behavior on the workplace, which would have beneficial effects on the sickness absence figures.

In addition to initiatives at individual and organizational level, adequate attention should be paid at the **legislative and policy level** to work quality and employment quality.
In **Europe**, legislators are becoming increasingly aware that job quality is an important feature to maintain our current social welfare systems. Indeed, work does not only adversely affect people's

health but employment has also strong positive effects. It can provide a sense of purpose and self-worth, opportunities to meet people and to learn new skills, it offers financial security and social status. Unemployed persons report more deterioration in health status, present more unfavorable behavior, have an increased use of health services and higher mortality in comparison with employed persons [99]. Additionally, in an aging population, the number of working people rapidly shrinks, representing a real threat for the social welfare systems and economic growth. Therefore, a key aim of Europe 2020 is to ensure that 75% of men and women aged 20-64 are in employment by 2020. One of the priorities in achieving this goal of higher employment rates, is to create 'better job quality and working conditions' [100]. Actually, high quality of work is demonstrated to be related with high employment participation. This is explained by the finding that the working environment is crucial in the development of the workforce potential. A committed workforce is in turn a critical competitiveness factor, which contributes to economic growth and welfare.

A recommendation that follows from the results from this thesis is that strategies should be developed to re-establish the indefinite contractual employment with regular working arrangements as the standard. Further, legislative initiatives should discourage the use of precarious, insecure contracts or regulations with long working hours.

Additionally, European initiatives to improve work quality by reducing job stress need mentioning here. First, the employer and union organisations adopted a Framework Agreement on work-related stress in 2004, in which was stated that all employers have the legal obligation to protect occupational safety and health of workers. It is explicitely mentioned that this also includes problems of work-related stress. The agreement also provides a method for employers to identify, and several approaches to prevent and manage job stress. The goal was that each Member State should implement the Agreement in accordance with the local procedures and practices. In 2011, a second evaluation was performed, which demonstrates that 19 EU countries have legislation or binding collective agreements that address stress or other psychosocial risks at work. This implies that, 7 years after ratification, the Agreement has not yet been implemented throughout Europe, which means that it is impossible to conclude that a minimum level of protection has been established throughout Europe [101]. In this evaluation report it is concluded that *"there is room for improvement, both at national and EU-level, as regards extending protection, and further developing adequate responses to the challenge. There is therefore scope for all stakeholders to consider further initiatives to ensure that the objective is reached*" [101].

In **Belgium**, social partners signed a national agreement on work-related stress in 1999. This agreement was declared obligatory for the private sector [102]. In 2007, this agreement was incorporated into legislation, which however mainly focused on the prevention of harassment and bullying. After publication of this law, several guidance and practical tools were developed by public authorities. Recently, this legislation concerning psychosocial risks at work was adapted and the scope was explicitely broadened to the whole range of psychosocial risk factors that could affect the health of the worker. In this perspective, the initiative of 'workable work' (*'werkbaar werk'*) in which the Social-Economic Council of Flanders (*Sociaal-Economische Raad van Vlaanderen*), consisting of both employers and trade union members, also aims to develop measures against stress and burn-out, is worth mentioning. 'Workable work' is defined as work that offers sufficient learning opportunities, that yields not too much stress, and that enables an equilibrium between work and private life. On their website, several examples of companies which are making efforts to create workable work are provided [103].

In conclusion, at the legislative and policy level, there is increasing awareness of the importance of job quality in maintaining our current social welfare system. However, implementation of the proposed regulation proceeds slowly and more employers need to be aware that improving job quality can have a positive impact on attendance behavior.

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# Summary

During the last decade, job quality has gained increased attention from researchers, employers and legislators. This is reflected in the Lisbon Strategy and the Europe 2020 targets of the European Union, which are stating that the qualitative aspect of jobs has to be considered as one of the major concerns. In the meanwhile, several reports on the growing number of precarious contracts and arrangements with a high level of job insecurity have been published. Additionally, increasing figures of work-related health problems, which are partly due to job stress, have been reported.

The relation between several aspects of job quality and a variety of outcomes has been studied by researchers from several schools. So far, a number of adverse psychological and physical health effects have repeatedly been associated with low job quality measures. On the other hand, some more attitude-related variables such as job satisfaction, leave intention and absenteeism have been less subject of investigation. Presenteeism, which is essentially the alternative choice for sickness absence an ill worker can opt for, has only recently received some attention from researchers. The relation between job quality, which comprises employment conditions and work quality such as the psychosocial work environment, and sickness absence has been investigated, while the relation between job quality and presenteeism is less examined. Nonetheless, it should be noticed that not only the burden of sickness absence is important for both society and employers, but also presenteeism is suggested to be associated with considerable expense, which may even exceed those of sickness absence.

Therefore, the general aim of this thesis is to improve insight into the relation between job quality, health and attendance behavior (including both sickness absence and presenteeism). To investigate the different study questions, three separate datasets were used. Most study questions were tested using the Belstress III dataset, which is a study conducted in Belgium in 2004 with the aim to examine the determinants of sickness absence from work. Some aspects concerning the relation between specific features of employment quality and attendance dynamic were investigated in a large dataset from the Fifth European Survey on Working Conditions, a study conducted in Europe in 2010. Finally, the particular question about the applicability of a biomarker to measure job stress was applied in a pilot study, which was set up in two production companies in Flanders, between 2012 and 2014.

**A first major aim** of the thesis was to investigate several **work-related factors** (both work quality and employment quality indicators, including factors that have gained less attention uptil now), in relation with **attendance behavior** (both presenteeism and sickness absence). Generally, findings underline the importance of job quality factors in the attendance behavior of employees and highlight that this behavior is not purely driven by the health status of the worker.
In a first study, the relation between measures of work quality with presenteeism was examined. Several dimensions, based on the well-established Job-Demand-Control-Support-model and Effort-Reward-Imbalance-model (which are two of the leading models in job stress research) were complemented with some less examined measures, such as work-family conflict and bullying. The results suggest a significant positive relation between bullying and presenteeism. There was no significant relation between family to work interference and presenteeism, while the opposite direction, high work to family interference, was significantly related with presenteeism.
In the second study, measures of work quality were prospectively examined in relation with two types of cause-specific sickness absence. Since mental and musculoskeletal diseases are leading causes of

sickness absence, the prospective relation between these work quality measures was examined with registered sickness absence due to these two specific types of diseases. The results demonstrate that low rewards were a risk factor for long-term sickness absence due to mental diseases. Work quality factors important for long-term sickness absence due to musculoskeletal diseases were low demands, low efforts and low job control. Bullying was a potent risk factor, contributing to both types of cause-specific sickness absence.
A third study was set up to get more insight into the complex interplay between job strain and bullying in relation with prospectively registered sickness absence. The results demonstrate that bullying was a mediating variable in the relation between job strain and long-term sickness absence, which is in line with the 'work environment hypothesis'.
In conclusion, results from these three studies underscore the value of the two established job stress models in research on work-related determinants of attendance behavior. Another important conclusion is the significant relation between bullying and attendance behavior. Bullying seems to be a very potent stressor, significantly associated with both sickness absence measures and presenteeism.
In a fourth study, indicators of employment quality were examined with attendance behavior, which was operationalized as several combinations of self-reported sickness absence and presenteeism. This approach allows getting more insight into the interchange between absenteeism and presenteeism. Overall, results revealed that all three indicators of low employment quality, i.e. long working hours, precarious employment and subjective job insecurity, were significantly related to different aspects of attendance behavior. Employees working more than 48h/week reported significantly less sickness absence without presenteeism, but they were reporting more presenteeism. Our findings concerning the relation between precarious employment and attendance behavior demonstrate an inverse relationship between precarious employment and sickness absence. However, we did not find a significant relation between precarious employment and presenteeism without sickness absence. Additionally, we observed that workers with a precarious contract reported less presenteeism in combination with sickness absence. Finally, those perceiving high job insecurity were only reporting higher sickness presenteeism without sickness absence, while no significant relationship could be determined with the other attendance behavior categories. Besides the finding that indicators of low employment quality were related to different aspects of attendance behavior, these results also underline the complex interplay between sickness absence and presenteeism. Consequently, it can be concluded that several factors seem to exert a joint impact on both sickness absence and presenteeism, while others are playing an opposite role on the two components of attendance behavior.

**The second aim of the thesis** was to examine **the relation between Body Mass Index** and both **presenteeism and sickness absence**. The results demonstrate a significant association of both overweight and obesity with high sickness absence among women, but not in male workers. In contrast, overweight and obese men reported significantly more presenteeism in comparison with their normal weight colleagues, while this association was not observed in the female population. The results thus suggest a gender difference in the impact of overweight and obesity on attendance behavior.

The third **aim** was to explore **the prospective relation between presenteeism and several measures of registered sickness absence**. As former research suggested that other mechanisms play a role in different measures of sickness absence, the current knowledge was expanded by evaluating the prospective relation with different types of sickness absence, i.e. short-term, long-term and frequent sickness absence. Results demonstrated that presenteeism was related with several measures of future

sickness absence, especially long-term sickness absence. These findings therefore underline the possible negative consequences of presenteeism behavior for the individual worker.

Finally, although a lot of researchers are searching for a suitable biomarker of stress, the feasibility for using hair cortisol as a biomarker of stress in the working environment remains uncertain. Therefore**, a fourth aim of this thesis** was to examine the **hair cortisol as a biomarker of job stress** (covering several measures of work quality) in a pilot sample of healthy Belgian workers. No significant associations could be revealed between hair cortisol concentration and standardized measures related to work psychosocial risk factors. A significantly lower mean hair cortisol concentration was found in shift workers in comparison with day workers. Additionally, a significantly higher mean hair cortisol concentration was demonstrated in workers with symptoms of depression. Consequently, these results suggest a limited applicability of this biomarker in job stress research, although this method may be a suitable marker for detecting early symptoms of depression. Nevertheless, it is recommended to replicate this research in larger study samples with a broader range of exposure to job stress.

After presenting the results, some **recommendations for future research** were formulated with respect to methodological improvements, broadening the outcome with other behaviors, more systematically implementing bullying in research on work quality, and further exploration of the underlying physiological mechanism. Also eventual positive consequences of attendance behavior and the gender aspect in the relation between job quality, health and attendance behavior merit more attention.

In the last section, recommendations to guide prevention strategies at both job level and organizational level were included. A first important aspect is that employers who aim to implement sickness absence management programmes, should also consider the phenomenon of presenteeism. Indeed, a human resources strategy that targets to tackle sickness absenteeism and purely focuses on reducing the sickness absence figures, may have a certain degree of collateral damage by increased presenteeism. Secondly, not only the health status of the worker is important, but also other factors are determinants of both sickness absence and presenteeism. Therefore, exclusively implementing health-promoting activities (which are essentially focusing on health and health behavior at the individual level) without considering the possible impact of working conditions and the psychosocial working environment, is not recommended. These kind of health promoting activities at individual level should be embedded in a broader culture in which efforts are made to enhance the quality of jobs. Therefore, also interventions at job level or at organizational level in order to change task characteristics, work conditions or social aspects, should be considered. Interventions using a participatory approach are likely to be the most promising ones. Generally, it is recommended to intervene in the workplace organization, i.e. to increase job control and influence over decisions, enhance task variety and enrich the job content, avoid ‘passive jobs’, encourage solidarity among workers and ensure support from hierarchy. Additionally, emphasis should be put on the prevention of bullying, which is suggested to have an important impact on attendance behavior. Finally, it was noticed that also at the legislative and policy level, there is increasing awareness of the importance of job quality in maintaining our current social welfare system. However, implementation of regulation proceeds slowly and more efforts should be undertaken to convince employers that improving job quality can have a positive impact on attendance behavior and simultaneously on productivity.

# Samenvatting

Gedurende het laatste decennium krijgt job kwaliteit meer en meer aandacht en dit zowel van onderzoekers, werkgevers en wetgevers. Dit weerspiegelt zich in de Lissabon Strategie en de Europe 2020 objectieven van de Europese Unie, die vermelden dat het kwalitatieve aspect van de jobs als één van de belangrijkste bekommernissen dient beschouwd te worden. Ondertussen melden verschillende publicaties echter een stijging van het aantal precaire contracten en overeenkomsten die gekenmerkt worden door een hoge job onzekerheid. Daarenboven worden ook een verhoogd aantal werk gerelateerde gezondheidsproblemen, die gedeeltelijk te wijten zijn aan werkstress, gerapporteerd.

De relatie tussen verschillende aspecten van job kwaliteit en uiteenlopende gevolgen werd reeds bestudeerd door onderzoekers van verscheidene scholen. Tot nu toe werden een aantal nadelige psychologische en fysische gezondheidseffecten herhaaldelijk in verband gebracht met lage job kwaliteit. Anderzijds werden een aantal meer gedragsgerelateerde variabelen (zoals job tevredenheid, neiging om de job te verlaten en absenteïsme) veel minder bestudeerd. Bovendien krijgt presenteïsme, wat in essentie het alternatief voor ziekteverzuim is, nog maar zeer recent enige aandacht van onderzoekers. De relatie tussen job kwaliteit, dat zowel de kwaliteit van de arbeidsvoorwaarden als de kwaliteit van werk (zoals de psychosociale werkomgeving) omvat, en absenteïsme werd in het verleden reeds onderzocht. De relatie tussen job kwaliteit en presenteïsme werd echter minder bestudeerd. Desalniettemin betekent niet alleen ziekteverzuim een substantiële kost voor zowel maatschappij als werkgevers. Ook presenteïsme wordt geassocieerd met een noemenswaardig verlies, dat zelfs groter zou zijn als dat van absenteïsme.

Het hoofddoel van deze thesis was om het inzicht in de relatie tussen job kwaliteit, gezondheid en 'aanwezigheidsgedrag'(wat zowel ziekteverzuim als presenteïsme omvat) van werknemers te verbeteren. Om de verschillende studievragen te bestuderen, werden drie datasets gebruikt. Het overgrote deel van de hypotheses werd getest op de Belstress III dataset. Deze studie werd in 2004 uitgevoerd in België en had als doel om de determinanten van ziekteverzuim te bestuderen. Een aantal aspecten betreffende de relatie tussen specifieke kenmerken van de arbeidsvoorwaarden en de aanwezigheidsdynamiek van werknemers werd bestudeerd in een grote Europese dataset (*the fifth European Working Conditions Survey*), die werd uitgevoerd in 2010. Tenslotte werd de specifieke vraag rond de toepasbaarheid van een biomarker om job stress te meten bestudeerd in een pilootstudie, die werd opgezet in de periode tussen 2012 en 2014 in twee productiebedrijven in Vlaanderen.

**Een eerste grote doelstelling van de thesis** was om de relatie tussen een **aantal werk gerelateerde factoren** (zowel indicatoren van de kwaliteit van werk als van de kwaliteit van de arbeidsvoorwaarden) en **het aanwezigheidsgedrag** (zowel ziekteverzuim als presenteïsme) te onderzoeken. In het algemeen benadrukken de bevindingen het belang van deze factoren in het aanwezigheidsgedrag van werknemers en beklemtonen ze dus dat dit gedrag niet zuiver gestuurd wordt door de gezondheidsstatus van de werknemer.
Eerst werd de relatie tussen verschillende indicatoren van werkkwaliteit en presenteïsme onderzocht. De verschillende dimensies, gebaseerd op de gevestigde '*Job-Demand-Control-Support'* en *'Effort-Reward Imbalance'* modellen (twee prominente modellen in het job stress onderzoek) werden aangevuld met een aantal minder onderzochte indicatoren, zoals werk-gezin combinatie en pesten. De resultaten suggereren een positieve relatie tussen pesten en presenteïsme. Er kon geen significante relatie vastgesteld worden tussen de indicator die een hoge inmenging van gezinsleven naar het werk

aangeeft en presenteïsme. De omgekeerde richting, de indicator die hoge inmenging van werk naar gezinsleven aangeeft, was wel significant geassocieerd met presenteïsme.
Ten tweede werden indicatoren van werkkwaliteit prospectief onderzocht in relatie met twee types van oorzaak-specifiek ziekteverzuim. Aangezien zowel mentale als musculoskeletale aandoeningen de belangrijkste oorzaken zijn van ziekteverzuim, werd de prospectieve relatie tussen de factoren van werkkwaliteit onderzocht met geregistreerd ziekteverzuim te wijten aan deze twee specifieke aandoeningen. De resultaten tonen aan dat lage mate van beloning (*rewards)* een risicofactor is voor langdurig ziekteverzuim te wijten aan mentale aandoeningen. Kwaliteit van werk factoren die belangrijk zijn voor langdurig ziekteverzuim te wijten aan musculoskeletale aandoeningen zijn: lage taakeisen *(demands)*, lage inspanningen *(efforts)* en lage controle *(control)*. Pesten was een zeer belangrijke risicofactor voor beide types van oorzaak-specifiek ziekteverzuim.
Een derde doel was om meer inzicht te krijgen in de complexe wisselwerking tussen *'job strain'* en pesten in relatie met prospectief geregistreerd ziekteverzuim. De resultaten tonen aan dat pesten een mediërende variabele is in de relatie tussen *'job strain'* en langdurig ziekteverzuim, wat in lijn is met de 'werkomgeving hypothese'.
Als besluit kan gesteld worden dat de resultaten van de hoofdstukken 3, 4 en 5 de waarde van de twee prominente job stress modellen in het onderzoek naar de werk gerelateerde determinanten van het aanwezigheidsgedrag ondersteunen. Een andere belangrijke conclusie is de significante relatie tussen pesten en aanwezigheidsgedrag. Pesten schijnt een zeer belangrijke stressor te zijn, die zowel met ziekteverzuim als met presenteïsme geassocieerd is.
Tenslotte werd de relatie onderzocht tussen indicatoren van arbeidsvoorwaarden en aanwezigheidsgedrag, dat werd geoperationaliseerd als verschillende combinaties van zelf-gerapporteerd ziekteverzuim en presenteïsme. Deze aanpak laat ons toe om meer inzicht te krijgen in de wisselwerking tussen absenteïsme en presenteïsme. Over het algemeen toonden de resultaten aan dat alle drie de kwaliteitsindicatoren van arbeidsvoorwaarden (zijnde lange uren werken, precaire contracten en jobonzekerheid) significant geassocieerd zijn met verschillende aspecten van aanwezigheidsgedrag. Werknemers die meer dan 48h/week werkten, rapporteerden significant minder ziekteverzuim zonder presenteïsme, en meer presenteïsme. De bevindingen betreffende de relatie tussen precaire contracten en aanwezigheidsgedrag toonden een omgekeerde relatie tussen precaire contracten en ziekteverzuim. Echter, we vonden geen significante relatie tussen precaire tewerkstelling en presenteïsme zonder ziekteverzuim. Daarenboven zagen we dat werknemers met een precair contract minder presenteïsme in combinatie met ziekteverzuim rapporteerden. Tenslotte, diegenen die een hoge mate van job onzekerheid ondervonden, rapporteerden enkel meer presenteïsme zonder ziekteverzuim, terwijl geen significante relatie kon worden vastgesteld met de andere categorieën van het aanwezigheidsgedrag. Naast de vaststelling dat verschillende indicatoren van lage kwaliteit van arbeidsvoorwaarden gerelateerd zijn aan aanwezigheidsgedrag, onderlijnen de resultaten ook de complexiteit van de wisselwerking tussen absenteïsme en presenteïsme. Als besluit volgt hieruit dat verschillende factoren een gezamenlijke impact hebben op zowel ziekteverzuim als presenteïsme, terwijl andere factoren een eerder tegengestelde rol hebben op de twee componenten van aanwezigheidsgedrag.

**De tweede grote doelstelling van de thesis** was om de relatie tussen **Body Mass Index** en zowel **presenteïsme als ziekteverzuim** te onderzoeken. De resultaten toonden een significante relatie tussen overgewicht/ obesitas en hoog ziekteverzuim bij vrouwen. Dit werd echter niet vastgesteld bij mannen. In tegenstelling hiermee, rapporteerden mannen met overgewicht en obesitas significant meer presenteïsme in vergelijking met hun collega's met normaal gewicht, terwijl deze associatie niet kon vastgesteld worden bij de vrouwen. De resultaten suggereren dus een gender verschil in de impact van overgewicht en obesitas op het aanwezigheidsgedrag.

**De derde doelstelling** van de thesis was **de prospectieve relatie tussen presenteïsme en verschillende types van geregistreerd ziekteverzuim** te onderzoeken. Aangezien vorig onderzoek suggereerde dat andere onderliggende mechanismen een rol spelen bij verschillende types ziekteverzuim, werd de huidige kennis uitgebreid door de prospectieve relatie te onderzoeken met verschillende types ziekteverzuim (zijnde kortdurend, langdurend en hoogfrequent verzuim). De resultaten toonden dat presenteïsme gerelateerd was aan de verschillende types ziekteverzuim, maar voornamelijk met langdurend ziekteverzuim. De bevindingen benadrukken dus de mogelijk negatieve gevolgen van dit presenteïsme gedrag voor de individuele werknemer.

Tenslotte, is in het onderzoek naar een geschikte biomarker voor stress, nog niet veel aandacht besteed aan de haalbaarheid om cortisol concentratie in haar te gebruiken als biomarker van stress in de werkomgeving. Daarom was **een vierde grote doelstelling haar cortisol concentratie als een biomarker van job stress** (gerelateerd aan verschillende indicatoren van werk kwaliteit) in een pilootgroep van gezonde Belgische werknemers te testen. Er konden geen significante associaties ontdekt worden tussen haar cortisol concentratie en gestandaardiseerde psychosociale risicofactoren. Een significant lagere gemiddelde haar cortisol concentratie werd aangetoond bij shiftwerkers in vergelijking met werknemers die enkel gedurende de dag werkten. Daarenboven werd een hogere gemiddelde haar cortisol concentratie aangetoond bij werknemers die symptomen van depressie rapporteerden. In het algemeen suggereren de resultaten dus een beperkte toepasbaarheid van deze biomarker in job stress onderzoek, alhoewel deze methode wel een geschikte marker lijkt te zijn om symptomen van depressie op te sporen. Echter, het is aangeraden om dit type onderzoek te herhalen in grotere studiegroepen met een bredere range van blootstelling aan job stress.

Na de voorstelling van de resultaten, werden **een aantal suggesties gegeven voor verder onderzoek**, zoals methodologische verbeteringen, de outcome verbreden met andere gedragingen , het opnemen van pesten als item in studies rond werkkwaliteit, en verder onderzoek naar de onderliggende fysiologische mechanismen. Ook eventuele positieve gevolgen van aanwezigheidsgedrag en het gender aspect in de relatie tussen job kwaliteit, gezondheid en aanwezigheidsgedrag verdienen meer aandacht.

In het laatste gedeelte werd advies geformuleerd om **preventiestrategieën** op zowel job niveau als op organisatie niveau in te voeren. Een eerste belangrijk aspect is dat werkgevers die een preventief ziekteverzuim programma willen implementeren, zich bewust moeten zijn van het presenteïsme fenomeen. Het is inderdaad zo, dat een HR-strategie, welke het ziekteverzuim wil doen dalen en daarbij enkel focust op de ziektecijfers, een zekere graad van collaterale schade kan hebben door een gestegen presenteïsme. Een tweede belangrijk aspect is dat niet enkel de gezondheid van de werknemer van belang is, doch ook andere factoren zijn determinerend voor zowel ziekteverzuim als presenteïsme. Daarom is het niet aangeraden om enkel initiatieven gericht op gezondheidspromotie (die zich essentieel focussen op gezondheid en gezondheidsgedrag op individueel niveau) te implementeren, zonder de impact van de arbeidsvoorwaarden en de psychosociale werkomgeving mee op te nemen. Dit type van gezondheidspromotie op individueel niveau moet ingebed worden in een bredere cultuur waarbij ook inspanningen worden geleverd om de job kwaliteit te verhogen. Interventies op job niveau of op organisatie niveau om de taakkarakteristieken, werkvoorwaarden of bepaalde sociale aspecten te veranderen, dienen derhalve in overweging genomen worden. Interventies die een participatieve aanpak hebben, lijken in deze context de meest belovende. Over het algemeen is het aangeraden om in te grijpen in de werkplaats organisatie, zodat job controle en invloed over

beslissingen worden verhoogd, taakvariatie verbeterd en de job inhoud verrijkt. Verder dienen passieve jobs vermeden te worden, solidariteit tussen werknemers aangemoedigd en de ondersteuning van de leidinggevenden verzekerd te worden. Daarenboven moet de preventie van pesten voldoende benadrukt worden, aangezien een belangrijke impact hiervan op het aanwezigheidsgedrag werd gesuggereerd.

Tenslotte, konden we op wetgevend en politiek niveau een groeiend bewustzijn vaststellen van het belang van job kwaliteit in het onderhouden van ons huidig sociaal welzijnssysteem. De implementatie van de regelgeving hieromtrent verloopt echter zeer traag en er dienen meer inspanningen geleverd te worden om werkgevers ervan te overtuigen dat het verbeteren van de job kwaliteit een positieve impact kan hebben op het aanwezigheidsgedrag en dus op de productiviteit.

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# Curriculum vitae

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## Education

2009-2015 Doctoral Schools Training Programme

- Analysis of Variance, Institute of Continuing Education in Science; Ghent University
- Structural equation modeling using Mplus, Utrecht Summer School, The Netherlands
- 'Statistische gegevensverwerking met behulp van PASW v18, organized by the Department of biostatistics; Faculty of Medicine.
- Introductory statistics. Basics of Statistical Interference, Institute of Continuing Education in Science; Ghent University.
- Logistic regression analysis. Institute of Continuing Education in Science; Ghent University
- Analysis of Variance. Institute of Continuing Education in Science; Ghent University
- Advanced Academic English: writing skills; organized by the doctoral schools of Life Sciences and Medicine.
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2006 Certificate of Diving Medicine
2000-2004 Master in Occupational Medicine, Catholic University of Leuven
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2002 Postgraduate in Radioprotection, Catholic University of Leuven
1993-2000 Bachelor and Master in Medicine, Catholic University of Leuven

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## A1 publications:

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2. Janssens H, Braeckman L, De Clercq B, Casini A, De Bacquer D, Kittel F, Clays E. (2014). Job strain indirectly affects long-term sickness absence through bullying: a mediation analysis using structural equation modeling. *ICOH-WOPS: International Congress for Occupational Health and Work Organisation and Psychosocial Factors, Abstracts.* Presented at the International Congress for Occupational Health and Work Organisation and Psychosocial Factors.

3. Janssens H, Braeckman L, De Clercq B, Casini A, De Bacquer D, Kittel F, Clays E. (2014). The indirect effect of job strain on long-term sickness absence through bullying: a mediation analysis using structural equation modeling. *Workplace Bullying and Harassment, 9th International conference, Abstracts*. Presented at the 9th International conference on Workplace Bullying and Harassment.

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